Chapter 3
REBUILDING AND MAINTAINING HMS FISHERIES

3.1 Management Under National Standard 1: The Maximum Sustainable Yield Control Rule

Two fundamental objectives of this fishery management plan are to halt or prevent overfishing and to rebuild overfished fish stocks to ensure the long-term sustainability of the stocks. In order to meet these objectives, managers must be able to determine when stocks are overfished and in need of rebuilding to the level that can support maximum sustainable yield (MSY). The MSY is the maximum long-term average yield that can be produced by a stock on a continuing basis. The MSY for any particular stock is characterized by a biomass (B) level, i.e., $B_{MSY,}$ and a fishing mortality rate (F), i.e., F_{MSY}. Thus, there are two important components to classification as an overfished fishery: a fishing mortality rate component and a stock biomass component. If F is higher than that required to produce MSY on a continuing basis, then overfishing is occurring. If B level has fallen to a level substantially below that which can produce MSY, then the stock is overfished.

According to the Technical Guidance for National Standard (NS) 1 (Technical Guidelines, Restrepo *et al.*, 1998), a "control rule" describes a variable (e.g. F) over which management has some directed control as a function of some stock size variable. This FMP uses a control rule referencing F as a function of stock size or biomass (B). These control rules identify "good" versus "bad" stock conditions as well as management actions that will make the stock condition change from "bad" to "good."

In these control rules, fishery managers must identify reference points, one for F and one for B, for each stock under management, that will identify when overfishing is occurring or when the stock is overfished. The Technical Guidelines call these two reference points "status determination criteria." The status determination criteria are: 1) the maximum fishing mortality threshold (MFMT); and 2) the minimum stock size threshold (MSST). If F exceeds MFMT, then overfishing is occurring. If B is lower than MSST, then the stock is overfished (see Figure 3.1). In either of these cases, the stock must be classified as "overfished" in NMFS' annual report to Congress, and the Magnuson-Stevens Act requires that NMFS must take management action to halt overfishing and rebuild the stock. The MSY control rule helps managers determine what level of fishing mortality is appropriate, given the stock's biomass level and the current fishing mortality rate.

In defining the status determination criteria in this FMP, NMFS uses the defaults described Technical Guidelines. In most cases, HMS species or species groups are considered data-moderate. However, some species, particularly specific shark species or skipjack tuna, may be considered data-poor. The only HMS which may potentially be considered data-rich would be bluefin tuna. Given the fact that most situations will be data-moderate, NMFS has decided to adopt the Technical Guidance defaults to the extent practicable. In some cases, however, it may be necessary to fall back on the data-poor defaults. Thus, these defaults are also described in the following sections. In all cases, NMFS will rely on the results of the SAFE report (Section 3.10) before changing these criteria from data-moderate to data-poor, consistent with the Technical Guidelines.

Figure 3.1 Rebuilding Parameters and Status Determination Criteria

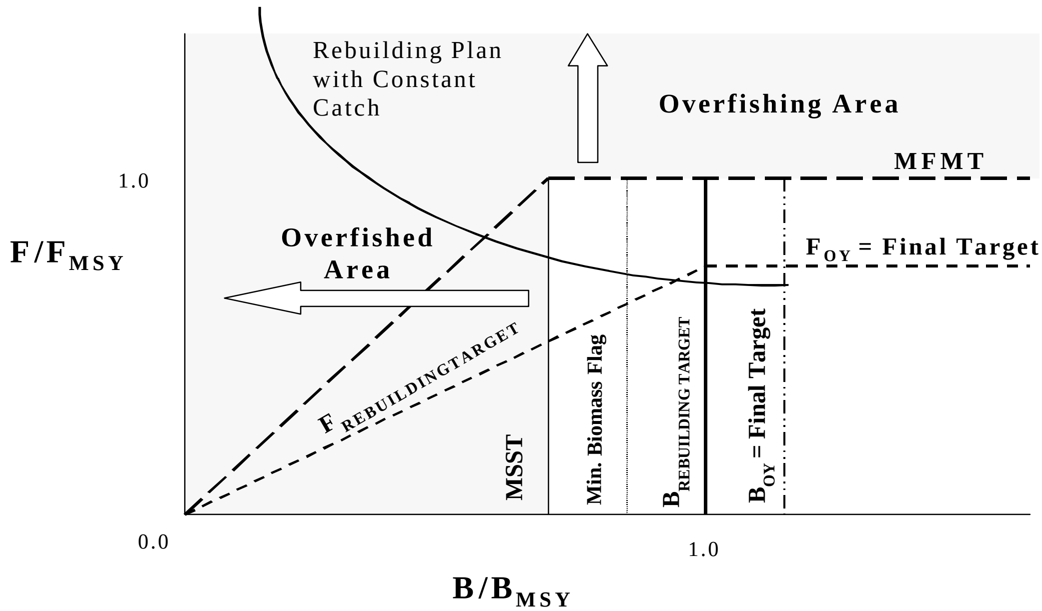

Figure 3.1 illustrates the major elements of a rebuilding program. Rebuilding programs or plans are special forms of control rules which are implemented when stock size has fallen below limit biomass levels and/or fishing mortality has increased above limit fishing mortality levels. The horizontal axis of Figure 3.1 represents the ratio of B to the stock's biomass at MSY (B_{MSY}); the vertical axis represents the ratio of F to the fishing mortality for the stock at MSY (F_{MSY}). The stock is "healthy" when B/B_{MSY} is greater than MSST, F/F_{MSY} is less than MFMT, and the stock is not in the rebuilding phase. At this point, the F that can be supported is F_{MSY}. If B falls below MSST, then F must be reduced to a level below F_{MSY} (MFMT) in order to rebuild the stock. The magnitude of the reduction in F depends on how severely the stock is overfished, its capacity to rebuild, and the selection of the recovery time.

The status determination criteria (MSST and MFMT) are also described in Figure 3.1. The MFMT (as described in Section 3.1.1) is a horizontal line. When F goes above MFMT, overfishing is occurring and must be stopped immediately. The MSST (as described in Section 3.1.2) is a vertical line. When B falls below MSST, the stock is considered overfished and must be rebuilt. Thus, fishery management measures should be designed to keep stocks safely in the unshaded part of the diagram by holding fishing mortality rates low enough and stock biomass levels high enough to avoid straying into the shaded areas.

There are several other important lines in Figure 3.1. The solid vertical line labeled "$B_{REBUILDING\ TARGET}$" represents the biomass that managers are trying to achieve during a rebuilding program. In the case of Atlantic HMS, $B_{REBUILDING\ TARGET}$ is equal to B_{MSY} ($B/B_{MSY} = 1$). Also shown are: 1) the fishing mortality rate that will produce the optimum yield (F_{OY}; horizontal line); 2) the equilibrium or average biomass associated with optimum yield (B_{OY}; vertical); 3) the minimum biomass flag (vertical); and 4) the curve expected under a rebuilding plan with a constant catch scenario. When a fishery is healthy, managers will try to set the fishing mortality rate so that it produces the optimum yield (OY), resulting in a stock size of

B_{OY}. OY is the yield from a fishery that will provide the greatest overall benefit to the nation, particularly with respect to food production and recreational opportunities and taking into account the protection of marine ecosystems. F_{OY} is the F_{MSY} from the fishery, *as reduced by* any relevant social, economic, or ecological factors. Since F_{OY} cannot exceed F_{MSY}, then B_{OY} (the equilibrium or average B associated with F_{OY}) must be equal to or greater than B_{MSY}. Biomass can be expected to fluctuate over time, due to changes in environmental conditions, recruitment to the stock, and other variables. However, when biomass drops to the level of the minimum biomass flag (Section 3.3.2), managers should be aware of the decline and should consider implementing measures to prevent the stock biomass from falling further to the MSST. Thus, the minimum biomass flag serves as a warning to consider remedial action before implementation of a formal rebuilding program is required.

All rebuilding plans found in this FMP have a constant catch scenario. Under this type of scenario, managers seek to maintain a constant level of landings and dead discards in consecutive years from the stock. As the stock rebuilds (B increases) fishing effort and F will decrease for the same amount of catch. Thus, once the stock is rebuilt, fishermen will not catch as great a portion of the stock as they catch when the stock is overfished. This FMP allows managers some flexibility in changing management measures in extreme cases to keep rebuilding on track. NMFS will depend on the results of the SAFE report for determining the status of the stock and will follow the framework procedure (Section 3.10) before changing any management measure. Please note that NMFS can only increase the biomass of the stock over time by changing behavior of the fishermen and the amount of fish they are allowed to land and discard.

This section presents the MFMT and MSST for Atlantic swordfish, tunas, and sharks. Each stock is evaluated in terms of these status determination criteria. Stocks that have been listed as overfished in NMFS' Report to Congress on the Status of Fisheries (i.e., north Atlantic swordfish, west Atlantic bluefin tuna, Atlantic bigeye tuna, and large coastal sharks) will be the subject of rebuilding plans in this FMP. Although north Atlantic albacore has not yet been listed in the annual Report to Congress, NMFS has determined that this stock is overfished based on the latest stock assessment and the status determination criteria defined in this FMP. NMFS will amend the FMP within the year to outline a rebuilding plan for north Atlantic albacore, which will establish the foundation that can be used to develop an international rebuilding program. Yellowfin tuna is not considered overfished at this time, however, NMFS is concerned with the findings of SCRS. The latest stock assessment found a range of fishing mortality rates, depending on the models used, but SCRS concluded that the relative fishing mortality rate probably exceeds one. NMFS will update the status of yellowfin tuna relative to the status determination criteria in the FMP as new scientific information becomes available. Quota levels and rebuilding schedules identified in this FMP may be modified in the future as a result of new stock assessment data and management recommendations from ICCAT, if the United States accepts these ICCAT recommendations.

3.1.1 The Maximum Fishing Mortality Threshold

$$\mathbf{MFMT = F_{limit} = F_{MSY}}$$

The maximum fishing mortality threshold (MFMT) is a fishing mortality rate (F) that allows managers and fishery participants to determine if overfishing is occurring. When F exceeds the MFMT, overfishing is occurring and remedial management action must be taken. For Atlantic HMS, the MFMT is the fishing mortality rate necessary to produce MSY on a continuing basis (F_{MSY}). While previous reviews of overfishing definitions (Rosenberg *et al*., 1994) have considered F_{MSY} to be an appropriate *target* reference point for ongoing fishery management, NSGs and the Technical Guidelines consider F_{MSY} to be the *limit* reference point, with a target reference point set at a more conservative value (see Section 3.2.3). This means that F_{MSY} should be considered an upper boundary, beyond which overfishing will be occurring. Note that Atlantic tunas and swordfish are managed internationally by ICCAT, whose objective is to treat F_{MSY} as a target, not a limit.

The Technical Guidelines recommend using proxies for F_{MSY} when MSY cannot be reliably estimated:

> *In the absence of data and analyses that can be used to justify alternative approaches, it is recommended that $F_{30\%}$ be used for stocks believed to have relatively high resilience, $F_{40\%}$ for stocks believed to have low to moderate resilience, and $F_{35\%}$ for stocks with"average" resilience. For stocks with very low productivity (such as rockfish and most elasmobranchs), fishing mortality rates in the range $F_{50\%}$ to $F_{60\%}$ are recommended as proxies for F_{MSY}. Less-preferred alternatives (in order of preference) are to use $F_{0.1}$, M, F_{max}, or F_{med} (however, if F_{med} is calculated from data collected when the stock was fluctuating around B_{MSY}, then it would be a good proxy for F_{MSY}).*

In this FMP, NMFS uses F_{MSY} for all species, however, in the future NMFS may need to use a proxy, such as $F_{50\%}$ or $F_{60\%}$, for some shark stocks. Thus, in cases where F_{MSY} cannot be reliably estimated or in the absence of information used to select appropriate reference points, NMFS will rely on the results of the SAFE report (Section 3.10) to arrive at the best proxy for F_{MSY}, consistent with the default proxies for F_{MSY} recommended in the Technical Guidelines.

The F levels used to set these criteria vary by species due to differences in species biology, the characteristics of the fishery, and the best scientific information available (Table 3.1). Several HMS are being fished at a rate higher than MFMT, indicating that overfishing is occurring for these stocks. In addition to looking at F levels, NMFS must consider the uncertainty estimates surrounding these levels. This FMP implements an uncertainty value of at least 50 percent (Section 3.7). As described in Table 3.1, several Atlantic HMS are being fished at a rate higher than the MFMT, indicating that overfishing is occurring.

Table 3.1 Fishing mortality rates of Atlantic HMS relative to the maximum fishing mortality threshold of F_{MSY}.

Species	**Relative Fishing Mortality Rate (F_{year}/F_{MSY})**	**Is Overfishing Occurring? i.e., is $F > F_{MSY}$?**
North Atlantic Swordfish	$F_{95} = 2.05F_{MSY}$	Yes
South Atlantic Swordfish	$F_{95} = 1.24F_{MSY}$	Yes
West Atlantic Bluefin Tuna	F_{97}/F_{MSY} (two-line)= 1.73 F_{97}/F_{MSY} (Beverton-Holt) = 4.10	Yes Yes
Bigeye Tuna	F_{96}/F_{MSY} = 1.5-2.2	Yes
North Atlantic Albacore Tuna	F_{97}/F_{MSY} = 1.39 (uncertain) F_{97}/F_{MAX} = 0.91 $F_{97}/F_{0.1}$ = 1.60	Yes
Yellowfin Tuna	F_{97}/F_{MSY} = variable, probably exceeds 1.0	No *
West Atlantic Skipjack Tuna	Unknown	Unknown *
Blacktip Shark	F_{97}/F_{MSY} = 3.52 (baseline) F_{97}/F_{MSY} = 3.74 (alternative)	Yes
Sandbar Shark	F_{97}/F_{MSY} = 2.70 (baseline) F_{97}/F_{MSY} = 1.62 (alternative)	Yes
Large Coastal Sharks (all species)	F_{97}/F_{MSY} = 6.34 (baseline) F_{97}/F_{MSY} = 6.03 (alternative)	Yes
Small Coastal Sharks	F_{86-91}/F_{MSY} = 0.89	No
Pelagic Sharks	Unknown	Unknown *

* See Chapter 2 for discussions on the status of yellowfin tuna, skipjack tuna, and pelagic sharks.

3.1.2 The Minimum Stock Size Threshold

$$\mathbf{MSST = B_{limit} = (1\text{-}M)B_{MSY} \text{ when } M < 0.5;}$$
$$\mathbf{MSST = B_{limit} = 0.5\ B_{MSY} \text{ when } M \geq 0.5}$$

The minimum stock size threshold (MSST) is the lower limit of a stock biomass level that allows fishery managers and participants to determine if a stock is overfished. When the stock biomass level falls below the MSST, the stock is overfished and remedial management action must be taken to rebuild the stocks to B_{MSY}. The levels described above are those defaults recommended in the Technical Guidelines for data-moderate situations. Most HMS species or species groups (swordfish, most tunas, some shark species) can be labeled as data-moderate. However, some species, particularly specific shark species, should be labeled data-poor. In data-poor cases the Technical Guidelines recommend that:

the default limit control rule be implemented by multiplying the average catch from a time period when there is no quantitative or qualitative evidence of declining abundance (Recent catch) by a factor depending on a qualitative estimate of relative stock size:

Above B_{MSY}:	*Limit catch = 1.00*(Recent catch)*
Above MSST but below B_{MSY}:	*Limit catch = 0.67*(Recent catch)*
Below MSST (i.e., overfished):	*Limit catch = 0.33*(Recent catch).*

In most cases, NMFS will implement the recommended defaults for data-moderate situations. However, for data-poor cases as recommended in the SAFE report, NMFS may implement the recommended defaults for data-poor situations using the framework procedure (Section 3.10). Regarding data-poor or data-moderate stock evaluations, NMFS scientists, as part of SCRS and the shark evaluation workshop, are enhancing data collection and analyses to improve NMFS' ability to make informed decisions about setting limits and targets.

Scientists and managers must take into account the life history characteristics of the species under consideration in the selection of appropriate status determination criteria. Species that take many years to reach reproductive age or those that produce few offspring may be more vulnerable to overfishing. Conversely, species that mature early and produce many young may be able to withstand higher levels of fishing pressure without overfishing occurring. Natural mortality (M) varies from stock to stock based on biological characteristics of the species. MSST is intrinsically linked to the population and reproductive characteristics of the stock through M. As described in Table 3.2, the biomass of several Atlantic HMS stocks is considerably lower than MSST, indicating that these stocks are overfished.

For Atlantic HMS, except yellowfin tuna, the MSST is the stock biomass level equal to one minus the quantity of the instantaneous natural mortality rate (M) multiplied by the average biomass necessary to produce MSY on a continuing basis ($B_{limit} = (1-M)B_{MSY}$). For yellowfin tuna, the natural mortality rate is greater than 0.5 (M = 0.6 at ages 2 and above) and the MSST is $0.5B_{MSY}$. Under the NSGs, the MSST is the highest of these two, therefore for yellowfin tuna, the higher value is selected.

Table 3.2 Biomass of Atlantic HMS relative to the minimum stock size threshold. Unless otherwise noted, MSST = $(1-M)B_{MSY}$.

Species	Relative Biomass (B_{year}/B_{MSY})	MSST	Is the Stock Overfished? (is B_{year}/B_{MSY} < MSST
North Atlantic Swordfish	$B_{96}/B_{MSY} = 0.58$	$0.8B_{MSY}$	Yes
South Atlantic Swordfish	$B_{96}/B_{MSY} = 0.99$	$0.8B_{MSY}$	No
West Atlantic Bluefin Tuna	SSB_{97}/SSB_{MSY} (two-line) = 0.48 SSB_{97}/SSB_{MSY} (Beverton-Holt) = 0.071 $SSB_{97}/SSB_{75} = 0.14 - 0.17$	$0.86SSB_{MSY}$ $0.86SSB_{MSY}$ $0.86SSB_{MSY}$	Yes Yes Yes
Bigeye Tuna[1]	$B_{97}/B_{MSY} = 0.6\text{-}0.8$	$0.6B_{MSY}$ (age 2+)	No
N. Atlantic Albacore Tuna	$B_{97}/B_{MSY} = 0.47$ (0.34 - 0.63) $B_{90\text{-}94}/B_{75\text{-}80} = 0.72$	$0.7B_{MSY}$	Yes
Yellowfin Tuna[1]	$B_{97}/B_{MSY} = 0.92 - 1.35$	$0.5B_{MSY}$ (age 2+) [2]	No
West Atlantic Skipjack Tuna	Unknown	Unknown	Unknown [4]
Blacktip Shark[3]	$N_{98}/N_{MSY} = 0.50$ (baseline) $N_{98}/N_{MSY} = 0.44$ (alternative)	$0.9B_{MSY}$	Yes
Sandbar Shark[3]	$N_{98}/N_{MSY} = 0.58$ (baseline) $N_{98}/N_{MSY} = 0.70$ (alternative)	$0.9B_{MSY}$	Yes
Large Coastal Sharks[3] (all species)	$N_{98}/N_{MSY} = 0.30$ (baseline) $N_{98}/N_{MSY} = 0.36$ (alternative)	$0.9B_{MSY}$	Yes
Small Coastal Sharks	$B_{91}/B_{MSY} = 1.12$	$0.9\ B_{MSY}$	No
Pelagic Sharks	Unknown	Unknown	Unknown [4]

[1]Natural mortality for yellowfin and bigeye tunas changes with age. For yellowfin tuna ages 0 and 1, M = 0.8 and for yellowfin tuna ages 2+, M= 0.6. For bigeye tuna, M=0.8 for ages 0 and 1, and 0.4 for ages 2+. The values of M for older age classes will be used in setting the MSST. Bigeye tuna was identified as overfished in the 1998 Report to Congress on the Status of Fisheries.

[2] In the case of yellowfin tuna, M is greater than 0.5, necessitating use of $0.5B_{MSY}$ as the MSST, rather than $(1-M)B_{MSY}$.

[3] Since most of the catch per unit effort series and catches were in number of fish rather than biomass or yield in weight, the production modeling method was used to estimate numbers of fish (N) rather than biomass (B).

[4]See Chapter 2 for a discussion on the status of skipjack tuna and pelagic sharks.

3.2 Overfished Stocks: Managing for Recovery

Once a stock is declared overfished, NMFS must initiate efforts to have a rebuilding plan in place within one year. NMFS considered a range of alternatives in deciding how to rebuild overfished stocks. This section presents a generic overview of the range of alternatives considered for all overfished HMS, from cessation of all fishing to less restrictive rebuilding options. The options that do not support requirements of the Magnuson-Stevens Act are rejected, and several options for managing fishing mortality within the range of feasible alternatives are analyzed further for each overfished species. In some cases, reductions in F may be achieved through measures other than reduced quotas (e.g., minimum sizes and time/area closures). While the Magnuson-Stevens Act requires the preparation of these rebuilding plans at this time, NMFS cannot take unilateral quota action for internationally managed stocks given the requirements of ATCA.

Four basic approaches cover the full range of alternatives considered for overfished stocks:

Prohibit all harvest (i.e., all sources of fishing mortality) of the overfished stocks - This alternative would lead to the fastest rebuilding of overfished stocks because it would achieve a fishing mortality rate of zero, leaving only reproduction and natural mortality to determine stock size. However, this alternative would impose severe restrictions on fishery participants, in both directed and incidental fisheries. At this time, this approach is inconsistent with the objectives of the FMP. This alternative is also impractical from a domestic management viewpoint because it would require prohibition of all gear capable of catching the overfished species in the wide-ranging area inhabited by the species, even in other fisheries, and in other countries. Given its practical shortcomings and adverse social and economic impacts, this approach is rejected.

Allow harvest in accordance with a rebuilding program - This approach is the only feasible alternative for overfished Atlantic HMS. In order to meet the FMP objective of rebuilding overfished stocks, fishing mortality rates must be adjusted in accordance with the rebuilding program. It is important to account for all sources of fishing mortality. To guide the rebuilding process, managers must select a biomass target that will achieve rebuilding and a recovery period during which rebuilding will take place. Using the biomass target and recovery period as goals, managers can select fishing mortality rates for the recovery period that will rebuild the stocks in the selected time period and allow management to proceed to the second phase, ongoing management of healthy stocks (Section 3.3). For swordfish and bigeye tuna, this FMP provides the foundation for developing international rebuilding programs.

Status Quo harvest (fishing mortality) levels - This approach would adopt the status quo harvest levels to serve as a rebuilding plan. If overfished Atlantic HMS stocks are being fished at rates in excess of the level required to produce maximum sustainable yield, fishing mortality must be reduced immediately. In cases where status quo harvest levels do not reduce fishing mortality to meet the requirements to halt overfishing and rebuild overfished stocks, this approach is rejected.

Increase the harvest to maximum sustainable yield levels - The Magnuson-Stevens Act and this FMP establish the maximum sustainable yield level as the highest acceptable long-term sustainable harvest level for any species under management. Based on this guidance, managers can allow harvest at fishing mortality rates up to the maximum sustainable yield level, given a level of uncertainty. This approach must be rejected for overfished stocks, however, because it would not meet requirements to rebuild overfished stocks. It should be noted that all overfished HMS are currently fished at a rate above the maximum sustainable yield level (Table 3.1); thus, this alternative is rejected.

After a biomass target and preferred recovery period have been selected, managers must determine which management tools should be used to meet the FMP objectives and requirements of the law. Annual quotas, an important tool used to control fishing mortality rates, will be a central part of HMS recovery programs. This is particularly true for bluefin tuna and swordfish because ICCAT uses quota management as the primary tool to control fishing mortality in these overfished fisheries. However, there are many additional management measures that can be implemented domestically and internationally to affect the species and size composition of the catch (times/area closures, gear modifications) and the conditions under which the fish may be possessed, retained, and/or sold. All of these factors can have an effect on fishing mortality and thus on the recovery trajectory for overfished stocks. In this FMP, these additional measures were considered in light of the contribution that they could make to rebuilding. All management alternatives were evaluated in the context of their expected success at meeting management objectives: rebuilding overfished stocks, or maintaining healthy stocks.

3.2.1 Biomass Target During Rebuilding

$$\mathbf{B}_{\textbf{REBUILDING TARGET}} = \mathbf{B}_{\textbf{MSY}}$$

Before a rebuilding program can be designed or implemented, managers must identify a goal, or biomass target, that will allow determination of when rebuilding is complete and the stock has returned to, or is maintaining, a healthy condition. This biomass target is used to establish management measures to guide the rebuilding process. The biomass target is a level of stock abundance at which harvesting of the resources can be sustained on a continual basis at the level necessary to support MSY. As discussed in the NSGs, rebuilding actions should do more than merely assure that the stock reaches the target level; rather, the goal is to restore the stock's capacity to that level on a continuing basis, consistent with its natural variability. The biomass rebuilding target is applicable only during the rebuilding phase of the management plan, and would signal recovery of the stock to a healthy condition.

In the case of Atlantic HMS, the biomass target for rebuilding overfished stocks is set at the average biomass level that allows harvest of maximum sustainable yield on a continuing basis (B_{MSY}). This approach is outlined in the NSGs as an appropriate way to address NS1. Use of a biomass target of B_{MSY} is consistent with ICCAT's management goal for tunas and tuna-like species and with management objectives for large coastal sharks that were established in the 1993 Atlantic Shark FMP. The spawning stock biomass necessary to produce maximum sustainable yield on a continuing basis (SSB_{MSY}) will be used as the metric for B_{MSY} for west Atlantic bluefin tuna.

3.2.2 Recovery Period: The Rebuilding Trajectory

After a rebuilding biomass goal has been established, a rebuilding trajectory is selected that will ensure consistent and reasonably rapid progress towards recovery, enabling stocks to be rebuilt within the time constraints of the Magnuson-Stevens Act. The final NSGs define "consistent progress" to mean that remedial action should be taken immediately, and that such action should include explicit milestones expressed in terms of measurable improvement of the stock with respect to its overfished status determination criteria. Section 304(e)(4) of the Magnuson-Stevens Act requires that the time period for rebuilding be as short as possible, but always less than ten years, except in cases where the biology of the stock of fish (e.g. large coastal sharks), other environmental conditions, or management measures under an international agreement in which the United States participates dictate otherwise (e.g., bluefin tuna, swordfish, bigeye tuna).

Under the NSGs, in cases where the stock cannot rebuild in ten years, even if the fishing mortality rate is reduced to zero, the rebuilding time period may be adjusted upwards to the extent warranted by biological considerations, the needs of fishing communities, and recommendations by international organizations in which the United States participates, as long as the rebuilding period does not exceed the time required to rebuild at zero fishing mortality rate plus one mean generation time for the species, or equivalent period based on the species' life history characteristics. If the stock can rebuild in less than ten years with zero fishing, the NSGs state that the time period for rebuilding may be adjusted up to ten years to account for the needs of fishing communities, recommendations by international organizations in which the United States participates, and the biology of the species. However, the rebuilding program should make consistent and reasonably rapid progress toward rebuilding the overfished stock. Because of differences in the biology of the stocks, the rebuilding period is different for each species. For example, it may be possible to rebuild swordfish within ten years, but large coastal sharks may not be rebuilt for 39 years.

The alternatives discussed throughout the rest of this chapter include a lower and an upper limit for recovery time periods. Within the range of feasible alternatives, the alternatives for recovery periods have been evaluated in the context of the FMP objectives and the requirements Magnuson-Stevens Act. Limits that were not consistent with the FMP objectives were rejected.

3.2.3 Target Control Rule During Rebuilding

After a biomass target and preferred recovery period have been selected, the fishing mortality rate is the only mechanism that can be directly controlled to achieve rebuilding. The Technical Guidelines indicate that the limit control rule establishes a set of pre-agreed plans for making management decisions about fishing mortality based on stock size. The pre-agreed nature of the measures ensures that management actions will be implemented without delay, enabling managers to respond rapidly to changing conditions. The NSGs state that, in selecting a fishing mortality rate that will result in a long-term average catch approximating maximum sustainable yield, NMFS should consider the characteristics of the fishery, the objectives of the FMP, and the best scientific information available. In setting a fishing mortality rate during rebuilding, primary consideration should be given to the FMP objectives to prevent overfishing and rebuild overfished stocks to the biomass associated with maximum sustainable yield level and to minimize adverse impacts on affected fishery participants. This section describes alternatives for setting the fishing mortality rate to rebuild overfished stocks.

Final Action: Constant Catch Control Rule

$$F_{target} < F_{MSY}$$

NMFS prefers to rebuild overfished HMS through the use of fixed quotas. The Technical Guidelines indicate that F_{target} may change depending on the value of the ratio of B to B_{MSY}. In cases where B/B_{MSY} is extremely low (less than half MSST), F_{target} may need to be reduced to zero, or as close to zero as possible. In cases where B/BMSY is between ½ MSST and B_{MSY}, F_{target} should be set to 75 percent of the F_{target} defined in Section 3.3.1. Based on the results of the SAFE report, NMFS will consider changing F_{target} as necessary.

SCRS commonly assumes that during the rebuilding period a fixed quota will be set; this management approach that is commonly recommended by ICCAT. A fixed quota, or constant catch, scenario implies a variable fishing mortality rate (F) during the rebuilding period, with F actually falling as the stock rebuilds under a constant quota (Figure 3.1). However, as the stock rebuilds and F falls, fishermen will enjoy increasing catch rates. The major advantage of constant quotas is relative stability for commercial and recreational fishery participants. Administrative costs of managing the fishery can also be minimized. Disadvantages include the use of a higher F earlier in the rebuilding period when stocks are more vulnerable. However, this concern can be addressed by setting catch levels low enough to ensure rebuilding while still allowing the fisheries to continue. Setting catch levels low enough to ensure rebuilding can result in high stock sizes at the expense of relatively small foregone yield.

As described in Section 3.1.1, there are times when F_{MSY} may be poorly estimated. This includes simulation studies or population analyses for data-poor species. In these cases, NMFS will rely on the results of the SAFE report to arrive at the best proxy for F_{MSY} consistent with the Technical Guidelines (see Section 3.1.1). In all cases, NMFS will ensure that F is less than the proxy for F_{MSY} during rebuilding using the uncertainty values described in Section 3.7. It should be noted that this final action does not preclude NMFS from using the method described in the rejected option below in the future.

Rejected Option for Target Control Rule

Rejected Option: Fixed fishing mortality rate ($F_{target} = 0.XF_{MSY}$)

During the rebuilding period, fishing mortality rates would likely need to be set below the rate that would support MSY. Managers would need to select a fishing mortality rate for the rebuilding period that would most efficiently, and with the highest probability of success, reach the biomass target within the selected time period. While this alternative is similar to the final action above, this option gives fishery managers less flexibility given the uncertainty of F, B, and the best scientific data available.

A fixed F strategy in which a target fishing mortality rate is set is less risky than a constant catch strategy for rebuilding overfished stocks (SCRS, 1998). The target fishing mortality rates are usually translated into corresponding quotas which require adjustment after each assessment, depending on the status of the stock. This could invite additional room for negotiation at ICCAT of less restrictive quotas. To prevent frequent changes in quotas and negotiations for less restrictive quotas, NMFS prefers setting a long-term constant catch strategy that is non-negotiable in the rebuilding interim, such as was negotiated at ICCAT in 1998 for bluefin tuna. In addition, variable quotas may have negative social and economic impacts on fishermen and higher administrative costs. Thus, this option is rejected.

3.3 Healthy Stocks: Managing for F_{OY}

The Magnuson-Stevens Act is clear in its requirement to prevent overfishing while achieving, on a continuing basis, optimum yield (OY). OY is the yield from a fishery that will provide the greatest overall benefit to the nation, particularly with respect to food production and recreational opportunities, taking into account the protection of marine ecosystems. For all stocks, it is critical to set precautionary thresholds to avoid overfishing. Target biomass and fishing mortality rates should be selected to maximize the likelihood that the maximum fishing mortality and minimum stock size thresholds will not be exceeded. This is consistent with the NSGs which indicate that target reference points, such as OY, should be set safely below limit reference points, which are defined by the status determination criteria. The criteria used to set target catch levels should be risk-averse, so that greater uncertainty regarding the status or productive capacity of a stock or stock complex corresponds to greater caution in setting target catch levels. HMS stocks that have not been determined to be overfished include skipjack tuna, yellowfin tuna, small coastal sharks, and pelagic sharks.

3.3.1 Target Control Rule for Healthy Stocks

$$\mathbf{F_{target} = 0.75\ F_{MSY} = F_{OY}}$$
$$\mathbf{B_{target} = B_{OY}}$$

F_{target} is used to set fishing mortality rates for healthy (non-overfished) stocks and after rebuilding of overfished stocks has been accomplished to ensure that the maximum fishing mortality threshold (F_{limit}) is not exceeded. F_{OY} is the F_{MSY} from the fishery, *as reduced by* any relevant social, economic, or ecological factors. For the HMS stocks that are not overfished, F_{OY} is set at the yield resulting from fishing at 75 percent of F_{MSY}. Thus, NMFS assumes that the relevant social, economic, and ecological factors reduce F_{MSY} by 25 percent. This is the default level recommended in the Technical Guidelines to provide a safety margin to ensure that the fishing mortality rate does not exceed the maximum fishing mortality threshold. As described in Section 3.1.1, proxies may be used for F_{MSY} based on the results of the SAFE report, consistent with the Technical Guidelines. B_{OY} is average biomass that corresponds to F_{OY}.

Based on modeling results (Restrepo, *et al*., 1998), F_{OY} is expected to average more than 90 percent of the maximum average long-term yield (i.e., maximum sustainable yield), for stocks that are not overfished. The target fishing mortality rate should be set sufficiently below the limit such that it offers a reasonable margin of safety and it is also possible to distinguish between the two statistically.[1] Setting the target fishing mortality rate below the minimum fishing mortality threshold of F_{MSY} also safeguards against uncertainty in stock assessments, imperfect implementation of management actions, and other factors that can cause the minimum fishing mortality threshold to be approached or surpassed. In addition, fishing at 75 percent of F_{MSY} reduces the probability that a stock will decline below MSST.

3.3.2 Biomass Approaching Overfished Designation: the Minimum Biomass Flag

$$\mathbf{(1\text{-}M)B_{OY} \text{ where } B_{OY} > B_{MSY}}$$

The biomass flag is useful to managers because it signals a decline in biomass before biomass falls to a level where the stock must be classified as overfished and in need of rebuilding. Since this is a precautionary variable, the biomass flag should be set in excess of the minimum stock size threshold (MSST) that identifies the stock as overfished (Figure 3.1) in order to alert managers and fishery to the need for action. Arresting stock biomass decline before the MSST is reached will allow managers to implement precautionary measures that may boost biomass and prevent overfishing. Consideration of the natural variations of population should also be a component in determining the value of this precautionary variable.

For Atlantic HMS, the minimum biomass flag is set at $(1\text{-}M)B_{OY}$ where $B_{OY} > B_{MSY.}$ B_{OY} is defined as the equilibrium B associated with F_{OY}. If the fishery is being fished at 75 percent of F_{MSY} (F_{OY}), the equilibrium biomass level (B_{OY}) may be approximately 125 to 130 percent of B_{MSY}, based on modeling results in the Technical Guidelines.

This minimum biomass flag establishes a biologically-linked measure that would trigger precautionary management action to ensure that a stock will not become overfished. Table 3.3 summarizes the biomass flags for Atlantic HMS stocks.

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[1] The limit fishing mortality rate is the equivalent of the maximum fishing mortality threshold (MFMT). For Atlantic HMS, the MFMT is F_{MSY}. Thus, F_{OY} should be set sufficiently below F_{MSY} to: 1) ensure that the limit is not regularly exceeded; and 2) that the two can be statistically distinguished from each other.

Table 3.3 Biomass of Atlantic HMS relative to the minimum biomass threshold.

Species	$(1\text{-}M)B_{OY}$
North Atlantic Swordfish	$0.8B_{OY}$
South Atlantic Swordfish	$0.8B_{OY}$
West Atlantic Bluefin Tuna	$0.86SSB_{OY}$
Bigeye Tuna[a]	$0.6B_{OY}$ (age 2+)
North Atlantic Albacore Tuna	$0.7B_{OY}$
Yellowfin Tuna[a]	$0.5B_{OY}$ (age 2+)[b]
West Atlantic Skipjack Tuna	Unknown [d]
Blacktip Shark[c]	$0.9B_{OY}$
Sandbar Shark[c]	$0.9B_{OY}$
Large Coastal Sharks[c] (all species)	$0.9B_{OY}$
Small Coastal Sharks	$0.9B_{OY}$
Pelagic Sharks	Unknown [d]

[a]Natural mortality for yellowfin and bigeye tuna changes with age. For yellowfin tuna ages 0 and 1, M = 0.8 and M = 0.6 for yellowfin tuna ages 2+. For bigeye tuna, M=0.8 for ages 0 and 1, and 0.4 for ages 2+. The values of M for older age classes will be used in setting the MSST.

[B]In the case of yellowfin tuna, M is greater than 0.5, necessitating use of $0.5B_{OY}$ as the MSST, rather than using $(1\text{-}M)B_{OY}$.

[C]Since most of the catch per unit effort series and catches were in number of fish rather than biomass or yield in weight, the production modeling method was used to estimate numbers of fish rather than biomass.

[d]See Chapter 2 for a description of the status of skipjack tuna and pelagic sharks.

3.4 Management Measures for Directed Fishing

3.4.1 Quota Alternatives

There are no significant safety implications of these quota alternatives. Although reducing quotas may increase the derby nature of HMS fisheries, NMFS is taking steps to mitigate those effects through effort controls, limited access, and other measures. NMFS will continue to monitor the derby nature of the fisheries and consider safety implications of new fishery conservation and management measures.

3.4.1.1 Atlantic Tunas

3.4.1.1.1 Bluefin Tuna Quota Alternatives

In 1998, SCRS developed a range of recovery options aimed at achieving spawning stock biomass levels that would support maximum sustainable yield (SCRS, 1998b). These options were developed using assumed relationships between spawning stock biomass and recruitment. SCRS did not select any of these relationships as being more likely to reflect reality than any other. As a result, a range of possible relationships were captured within the results of two models - the Beverton-Holt model and the two-line model. These models produced very different estimates of maximum sustainable yield (7,700 mt ww and 2,800 mt ww, respectively). SCRS was unable to arrive at a consensus as to which stock-recruitment model might better reflect the population dynamics of west Atlantic bluefin tuna.

According to the Beverton-Holt model, maximum sustainable yield would likely be difficult to achieve within 20 years even in the absence of any catches. A 2,000-mt ww catch would allow for a 1.5-fold recovery to about ten percent of the level that would support maximum sustainable yield (approximately 7,700 mt ww under this assumption). However, according to the two-line model, a TAC of 2,500 mt ww would allow the spawning stock biomass to double over the next 20 years, reaching 93 percent of the biomass that could support maximum sustainable yield (approximately 2,800 mt ww under this assumption). Thus, under the two-line stock recruitment relationship, in order to have about a 50-percent chance of reaching biomass levels that support maximum sustainable yield within 20 years, current catches need not be reduced. SCRS also concluded that if existing levels of catches are maintained, it is unlikely that there will be a measurable change in the status of the stock in the short term using either model for assessments.

The quota alternatives discussed below result from different rebuilding periods, assuming that each quota remains constant throughout the rebuilding time period. This is consistent with ICCAT's general practice on quota recommendations and SCRS' practice on stock status projections over time. There are an infinite number of recovery trajectories which could be selected to rebuild a stock within a specific time frame. For example, SCRS has investigated several alternative trajectories in which the west Atlantic bluefin tuna quota is adjusted as the recovery period varies. At each level of constant quota there is a different time period associated with recovery.

Final Action: Adopt the ICCAT Rebuilding Program (recovery to biomass rebuilding target in 20 years)

The Magnuson-Stevens Act and NSGs provide guidance to address the limitations imposed by an international body whose management recommendations may not readily conform to the rebuilding time frame required by the Act. The primary objective of management of the bluefin tuna fishery is now to rebuild the stock to levels that will support the optimum yield, rather than maintaining a scientific monitoring quota. Based on the 1998 stock assessment, parties at the 1998 meeting of ICCAT established a Rebuilding Program for west Atlantic bluefin tuna with the goal of reaching maximum sustainable yield in 20 years. This binding recommendation sets the annual TAC at 2,500 mt ww. The landings quota allocated to the United States was increased by 43 mt from 1,344 mt to 1,387 mt ww, to apply annually, until such time as the TAC is changed based on advice from SCRS. The U.S. allowance for dead discards is an additional 68 mt ww. If there are dead discards in excess of this allowance, they must be counted against the following year's quota. If there are fewer dead discards, then half of the underharvest may be added to the following year's quota while the other half is conserved. The new recommendation also allows four years to balance the eight percent tolerance for bluefin tuna under 115 cm (young school and school bluefin tuna).

The ICCAT Rebuilding Program provides flexibility to alter the TAC, the maximum sustainable yield target, and/or the rebuilding period based on subsequent scientific advice. However, the annual TAC of 2,500 mt ww will not be altered unless there is evidence that a catch level greater than 2,700 mt ww or less than 2,300 mt ww would have at least a 50-percent probability of rebuilding the stock to maximum sustainable yield within the 20-year time frame. (See Appendix 2 for a description of the recommendation adopted by ICCAT). This Rebuilding Program includes targets for recovery, limits, and explicit interim milestones expressed in terms of measurable improvement of the stock. The rebuilding time frame provides a specified recovery period, biomass targets, fishing mortality rate limits, and explicit interim milestones that support the objectives of the FMP and the intent of the Magnuson-Stevens Act.

Ecological Impacts

The 1998 bluefin tuna stock assessment concluded that, based on the two-line stock recruitment model, west Atlantic bluefin tuna spawning stock biomass has a 90-percent probability of recovering to levels that would support a maximum sustainable yield of 2,800 mt ww in approximately 20 years (by 2019), under a TAC of 2,500 mt ww. Under a different stock recruitment model (Beverton-Holt), however, the 1998 stock assessment found that a 2,500-mt ww west Atlantic TAC could not be sustained, and that catches would need to be reduced to zero to allow a recovery which would support a maximum sustainable yield of 7,700 mt ww in approximately 20 years. The ICCAT Rebuilding Program provides flexibility to alter the TAC, the maximum sustainable yield target, and/or the rebuilding period based on subsequent scientific advice that a catch level greater than 2,700 mt ww or less than 2,300 mt ww would have at least a 50-percent probability of rebuilding the stock to maximum sustainable yield within the 20-year time frame. After subtracting the 79 mt ww allowance for dead discards and the quotas for Bermuda and St. Pierre et Miquelon, this plan establishes an overall landings quota of 2,413 mt ww, a 2.5-percent increase from the 1997 to 1998 level of 2,354 mt ww. This results in a U.S. landings quota of 1,387 mt ww, a 3.2-percent increase from the 1997 to1998 U.S. landings quota of 1,344 mt ww.

Assuming that the U.S. quota remains at 1,344 mt ww, that the domestic allocation scenario remains at 1997 percentage shares, and that the average weights of school, large school/small bluefin tuna, and large medium/giant bluefin tuna landed are 40 pounds, 135 pounds, and 415 pounds, respectively (based upon recent average sizes from the NMFS Large Pelagic Survey and the NMFS Northeast Region Bluefin Dealer Database), this scenario would result in an estimated 14,808 bluefin tuna being landed by the United States (5,857 $\geq$ 73 inches curved fork length (CFL) and 8,951 < 73 inches CFL) each year until stock rebuilding is complete, an increase of 3.1 percent from the status quo. This also assumes that the Reserve quota is divided equally between large medium/giant and large school/ small medium bluefin tuna (and not to the school bluefin subquota, for which there is now a separate reserve - see Section 3.4.2.1.1). Impacts of alternative allocations and other management measures that could affect the size selectivity of catch (thus the number of fish caught to make up the 2,500 mt ww and 1,387 mt ww) under the ICCAT Rebuilding Program are discussed later in this document.

As the TAC for west Atlantic bluefin tuna remains at status quo levels, and the U.S. domestic landings quota will increase by only a small amount, impacts to other finfish stocks and protected species will most likely be minimal.

Social and Economic Impacts

As mentioned above, the domestic U.S. landings quota will increase by approximately three percent compared to the status quo. As a result, the present value of gross and net revenues, as well as angler consumer surplus, are approximately three percent higher than those that would be associated with status quo landings levels. Using the selected alternative for domestic allocation, the dollar amounts for these measures are $227 million, $92 million and $234 million, respectively. Dollar amounts of the present values of Angler Consumer Surplus and net and gross revenues for all alternatives are listed in Chapter 7.

The increase in the quota for the United States could result in increased fishing opportunities and revenues to the commercial and recreational industries. Since this measure is very similar to the status quo, however, social impacts will most likely be minimal. Also, as the level of catch during rebuilding is not much different than after rebuilding is complete, the effects of the transition to quota levels after the stock is rebuilt would be minimal as well, particularly when discounted under present value analyses.

The west Atlantic bluefin tuna stock supports important recreational and commercial fisheries. Many fishing communities along the Atlantic coast depend on these fisheries at various times of the year. The community profiles in Chapter 9 describe the social environment of the fishery and the potential community impacts of the various alternatives.

Conclusion

The ICCAT Rebuilding Program adopted in 1998 meets the standards of the Magnuson-Stevens Act in that it includes an appropriate rebuilding time period, targets, limits, and explicit interim milestones for recovery expressed in terms of measurable improvement of the stock. While the quotas may have to be adjusted based on additional scientific evidence as specified in the terms of the recommendation, the ICCAT Rebuilding Program requires that ICCAT keep rebuilding on schedule. The final action is also consistent with ATCA, as it implements a quota equal to that allocated to the United States by ICCAT, and maintains traditional fishing patterns of fishing vessels of the United States.

Rejected Options for Bluefin Tuna Quota Alternatives

Rejected Option: Status quo - scientific monitoring quota for bluefin tuna

Under this alternative, the landings quota for west Atlantic bluefin tuna, 2,354 mt ww, with 1,344 mt ww allocated to the United States, would remain the same as in 1997 to 1998. The 1998 SCRS stock assessment projects that these catch levels would result in an increase of the spawning stock biomass to levels which would support a maximum sustainable yield of 2,800 mt ww in about 20 years (by 2019). Other ICCAT management recommendations that were in place prior to the 1998 rebuilding plan for west Atlantic bluefin tuna include minimum sizes, quotas (including an eight percent tolerance on school bluefin tuna), a statistical document program, time/area closures, and compliance measures. However, in the past, these conservation and management measures have not been implemented as a coordinated rebuilding plan with specific targets, recovery trajectories, and milestones.

Ecological Impacts

Under this alternative, the overall west Atlantic landings quota and U.S. national quota would stay at 1997 to1998 levels (2,354 and 1,344 mt ww/year, respectively), with the overall west Atlantic TAC remaining at 2,500 mt ww. Assuming status quo catch levels and the same size selectivity of catch, the 1998 SCRS assessment projects that, under the two-line stock-recruitment model, there is a 50-percent chance that the spawning stock biomass will increase to levels which would support a maximum sustainable yield of 2,800 mt ww in approximately 20 years (by 2019). Under the Beverton-Holt model, however, there is a greater than 50-percent chance that a TAC of 2,500 mt ww cannot be sustained, and that catches would need to be reduced to zero to allow a recovery of the stock to levels that would support a maximum sustainable yield of 7,700 mt ww in approximately 20 years.

Assuming that the U.S. quota remains at 1,344 mt ww, the domestic allocation scenario remains at 1997 percentage shares, and that the average weights of school, large school/small bluefin tuna, and large medium/giant bluefin tuna landed are 40 pounds, 135 pounds, and 415 pounds, respectively, this scenario would result in an estimated 14,363 bluefin tuna being landed by the United States (5,676 $\geq$ 73 inches CFL and 8,687 < 73 inches CFL) each year.

This alternative would not establish a coordinated rebuilding program with specific targets, recovery trajectories, and milestones. In place of a long-term rebuilding plan, the TAC would be open to renegotiation following the next stock assessment. In contrast to the final action, this alternative would not establish a mechanism to ensure that there is at least a 50-percent probability of rebuilding the stock within 20 years. This alternative would not allow the “automatic” adjustment of the quota should future assumptions show that 2,500 mt ww does not carry with it a 50-percent probability of doubling the spawning stock biomass in 20 years. This alternative would also maintain the west Atlantic bluefin tuna fishery as a scientific monitoring quota. The primary objective of a scientific monitoring quota is not to manage the fishery at optimum yield, but rather to use the fishery to monitor changes in stock size. As this alternative is the status quo, impacts on other fish stocks, protected species, and essential fish habitat are described in the Chapter 2 and other sections of the FMP.

Social and Economic Impacts

The expected commercial ex-vessel revenues for this alternative, for the 1999 fishing year, by commercial fishing category (assuming status quo/preferred allocations and using 1997 average prices), are shown in Table 3.4. The present value of gross and net revenues for the 1999 to 2038 period under this alternative are estimated to be $224 million and $90 million, respectively (see Chapter 7). The present value of Angler Consumer Surplus for this alternative for the same period is estimated to be $228 million (see Chapter 7). These results are used as the baseline for comparing the economic consequences of other alternatives.

Conclusion

Many bluefin tuna fishermen who commented on quotas have indicated that the quota should be maintained or increased. This alternative, however, lacks a rebuilding program with a specific recovery period, target biomass and fishing mortality rate, and milestones to adjust the rebuilding trajectory, and thus does not meet requirements of the Magnuson-Stevens Act or guidance contained in the NSGs to rebuild overfished fisheries. This alternative would also violate ATCA, as well as the Magnuson-Stevens Act, as it would implement a quota less than that allocated to the United States by ICCAT. It could also have a negative impact on traditional fishing patterns of fishing vessels of the United States.

Table 3.4 Projected 1999 ex-vessel gross revenues in the U.S. Atlantic bluefin tuna fishery by commercial fishing category under status quo rebuilding and quota allocation alternatives (based on 1997 prices).

Category	Gross Revenues
General	$10,280,094
Harpoon	$960,721
Longline	$1,330,299
Trap	$11,773
Purse Seine	$4,558,011
TOTAL	**$17,140,898**

Rejected Option: Ten-year rebuilding program (2,000 mt ww west Atlantic quota)

This alternative would require that overfished stocks of west Atlantic bluefin tuna be rebuilt to the spawning stock biomass necessary to produce maximum sustainable yield on a continuing basis in ten years, which, using the two-line stock recruitment model, could be achieved with a 2,000-mt ww TAC. This alternative was chosen for analysis because section 304(e)(4) of the Magnuson-Stevens Act requires that the time period for rebuilding overfished fisheries be as short as possible, but always ten years or less, except in cases where the biology of the stock of fish, other environmental conditions, or management measures under an international agreement in which the United States participates dictate otherwise. While the international agreement clause does apply bluefin tuna, investigating a ten-year recovery program is a viable option due to the emphasis on the ten-year rebuilding time-period in the Magnuson-Stevens Act.

Ecological Impacts

The 1998 stock assessment concluded that, using the two-line stock recruitment model, the west Atlantic bluefin tuna spawning stock biomass would recover to levels which would support a maximum sustainable yield of 2,800 mt ww in ten years under a TAC of 2,000 mt ww. However, under a different stock recruitment model (Beverton-Holt), the 1998 stock assessment found that a 2,000-mt ww west Atlantic quota would not result in the spawning stock biomass necessary to produce maximum sustainable yield on a continuing basis, but would result in a 20-percent increase in the spawning stock biomass over approximately 20 years. After subtracting an allowance for dead discards and the quotas for Bermuda and St. Pierre et Miquelon, this alternative would require a reduction of the overall landings quota to approximately 1,913 mt ww, a 19-percent reduction from the current level of 2,354 mt ww. Under the two-line stock-recruitment model, this catch level would provide a 50-percent chance of recovery to the spawning stock biomass necessary to produce maximum sustainable yield on a continuing basis in ten years, and would result in a U.S. landing quota of approximately 1,100 mt ww, an 18- percent reduction from the current U.S. quota of 1,344 mt ww (see Table 3.5).

Assuming status quo domestic allocations and size selectivity of catch, this alternative would result in an 18-percent reduction in numbers of fish landed by the United States and a similar reduction in west Atlantic landings, compared to status quo catch levels. Using the average sizes for school, large school/small medium, and large medium/giant bluefin tuna, this alternative would result in an estimated 11,747 bluefin tuna being landed by the United States (4,643 $\geq$ 73 inches CFL and 7,104 $<$ 73 inches CFL) each year until stock rebuilding is complete (assuming status quo domestic allocations). Impacts of alternative allocations and other management measures that could impact the size selectivity of catch (thus the number of fish caught to make up the 2,000 mt ww and 1,100 mt ww) under a ten-year rebuilding plan are discussed later in this document.

This reduction in quota could increase incidental catches and discards of bluefin tuna due to the mixed species nature of many fisheries for HMS. In addition, as the stock recovers and abundance increases, incidental catches and discards could increase further. Alternatives addressing incidental catch and discard reduction are discussed later in this chapter. A lower bluefin tuna quota could also cause a shift in both commercial and recreational fishing effort, and perhaps mortality, towards other HMS as well as other fish stocks. However, most of the HMS species to which commercial and recreational fishing effort could shift are also overfished and would be undergoing similar rebuilding efforts. Stocks that are fully fished or overfished, such as yellowfin tuna, bigeye tuna, north Atlantic albacore tuna, and sharks, would likely be most vulnerable to problems caused by additional fishing mortality resulting from displaced effort.

Social and Economic Impacts

Net economic benefits are reduced under this alternative as compared with the status quo and final action. With a rebuilding period of ten years, the U.S. landings quota is approximately 18 percent lower than the status quo landings quota and 21 percent lower than the landings quota under the final action. Although the post-rebuilding quotas are higher than those under status quo, the revenues they generate are heavily discounted in the present value analysis because they occur many years from now. As a result, the present value of gross and net revenues, as well as Angler Consumer Surplus, are nine percent lower for this alternative than under the status quo. The dollar amounts for these measures under this alternative are $204 million, $82 million and $208 million, respectively. The above figures all assume status quo/preferred domestic allocations among sectors of the fishery. In addition to changes in net economic benefit, there would be economic impacts in the form of reductions in commercial and recreational fishing expenditures such as bait, fuel, and ice.

The west Atlantic bluefin tuna stock supports important recreational and commercial fisheries. Many fishing communities along the Atlantic coast depend on these fisheries at various time of the year. This alternative would have a negative impact on all categories due to the quota reduction, which would affect gross revenues and fishing opportunities. Some displacement from the fishery is likely as commercial fishermen, charter/headboat captains, and dealers cease operations and recreational vessel owners elect to leave the fishery to pursue other species or to participate in other recreational activities. Recent surveys of the recreational fishing community (Ditton, 1998; Wilson *et al*., 1998) found that tunas were the first choice target species of many anglers, and it is expected that a bluefin tuna quota reduction could cause some of these people to leave the fishery or to target other species.

Conclusion

This alternative would allow NMFS to meet requirements of the Magnuson-Stevens Act to implement a rebuilding program for bluefin tuna. It is consistent with the NSGs and the Technical Guidelines because it provides a framework for a rebuilding program with a specific recovery period, targets, and limits. This alternative is rejected, however, as it would negatively impact commercial and recreational fisheries and is more restrictive than that allowed under the requirements of the Magnuson-Stevens Act. In addition, this alternative was not the rebuilding program agreed to at ICCAT, and the United States must work with other fishing nations in the Atlantic to ensure rebuilding. Furthermore, § 304(e) of the Magnuson-Stevens Act specifies that rebuilding programs for highly migratory species must reflect traditional participation in the fishery, relative to other nations, by fishermen of the United States. In addition, NS 8 requires that conservation and management measures provide for the sustained participation of fishing communities and that management measures minimize, to the extent practicable, adverse impacts on those communities, while remaining consistent with conservation requirements. The rebuilding requirements of the Magnuson-Stevens Act and the NSGs can be met with less significant social and economic disruption to the fishery by adopting the ICCAT Rebuilding Program, which this FMP implements as a final action.

Table 3.5 U.S. Quota (in metric tons) into the Future under Rebuilding Alternatives*

Year	Status Quo	10-Year Recovery	ICCAT Rebuilding Program (20 Years) FINAL ACTION
1999	1,344	1,100	1,387
2000	1,344	1,100	1,387
2001	1,344	1,100	1,387
2002	1,344	1,100	1,387
2003	1,344	1,100	1,387
2004	1,344	1,100	1,387
2005	1,344	1,100	1,387
2006	1,344	1,100	1,387
2007	1,344	1,100	1,387
2008	1,344	1,100	1,387
2009	1,344	1,100	1,387
2010	1,344	1,415	1,387
2011	1,344	1,415	1,387
2012	1,344	1,415	1,387
2013	1,344	1,415	1,387
2014	1,344	1,415	1,387
2015	1,344	1,415	1,387
2016	1,344	1,415	1,387
2017	1,344	1,415	1,387
2018	1,344	1,415	1,387
2019	1,344	1,415	1,387
2020	1,415	1,415	1,415
2021	1,415	1,415	1,415
2022	1,415	1,415	1,415
2023	1,415	1,415	1,415
2024	1,415	1,415	1,415
2025	1,415	1,415	1,415
2026	1,415	1,415	1,415
2027	1,415	1,415	1,415
2028	1,415	1,415	1,415
2029	1,415	1,415	1,415
2030	1,415	1,415	1,415
2031	1,415	1,415	1,415
2032	1,415	1,415	1,415
2033	1,415	1,415	1,415
2034	1,415	1,415	1,415
2035	1,415	1,415	1,415
2036	1,415	1,415	1,415

*Assumes U.S. share of quota to be 57.48% when west Atlantic quota is less than 2,413 mt ww, and 52.14% when west Atlantic quota is greater than 2,660 mt ww, after subtracting the allowance for dead discards and the quotas for Bermuda and St. Pierre et Miquelon. Also assumes maximum sustainable yield = 2,800 mt ww.

3.4.1.1.2 Bluefin Tuna Domestic Allocation

The United States allocates its annual bluefin tuna quota among five sectors of the fishery in order to collect the broadest possible array of scientific information and to optimize social and economic benefits. The 1998 ICCAT Recommendation changed the basis upon which the harvest of west Atlantic bluefin tuna was authorized. The focus on allocating quota for scientific monitoring purposes was replaced with a focus on rebuilding the stock and managing the fishery for continuing optimum yield. However, ICCAT continues to require all contracting parties, non-contracting parties, entities, and fishing entities to provide the best available data for the assessment of the stock by SCRS, including information on the catches of the broadest range of age classes possible. NMFS maintains that the collection of the best available scientific data, which is ensured by keeping the fishery categories that collect catch per unit effort information (i.e., the Angling and General categories) open over as long a time period and as large a geographic area as possible, is an important factor to consider in the domestic management of the bluefin tuna fishery.

In 1992, NMFS established "base" quotas for each category in the bluefin tuna fishery based upon the historical share of landings in each of these categories during the period 1983 through 1991. These quotas were used in 1992, 1993, and 1994, then modified in 1995 when the Purse Seine category quota was reduced by 51 mt ww to 250 mt ww. The main reason for the reduction in the Purse Seine category quota was that the primary purpose of the scientific monitoring quota was to provide data for stock assessments. The Purse Seine category does not provide a catch per unit effort time series used to estimate trends in stock size. Other reasons for reducing the Purse Seine quota in 1995 were issues raised by constituents of “fairness and equity”, and the greater employment generated in the non-Purse Seine categories. Also in 1995, four mt ww were transferred from the Incidental category to the Angling category to account for landings of large medium and giant bluefin tuna in the consolidation of recreational permits. In 1997, quota allocations were slightly modified from the 1995 base levels to more accurately reflect recent trends in fleet size, effort, and landings by category, and also to reflect the scientific monitoring nature of the west Atlantic quota. In 1998, allocations remained the same as in 1997, but were modified slightly after accounting for under- and over-harvests in certain categories.

The 1998 ICCAT Recommendation on west Atlantic bluefin tuna increased the landings quota allocated to the United States by 43 mt ww from 1,344 mt ww to 1,387 mt ww, to apply annually, until such time as the TAC is changed based on advice from SCRS. The recommendation established a 79 mt ww allowance for dead discards for the west Atlantic, of which the United States was allocated 68 mt ww. Consistent with the Recommendation, for any of the following alternatives, if NMFS determines that the U.S. annual dead discard allowance has been exceeded, NMFS would subtract the amount in excess of the allowance from the total amount of bluefin tuna that can be landed. If NMFS determines that the annual dead discard allowance has not been reached, NMFS may add half of the remainder to the total amount of bluefin tuna that can be landed. Under ATCA, no regulation may have the effect of increasing or decreasing the ICCAT-recommended quota.

The 1998 ICCAT Rebuilding Program also allows four years to balance the eight-percent tolerance for bluefin tuna under 115 cm (young school and school bluefin tuna). The United States currently allows the eight percent to be landed under the Angling category quota on an annual basis. The FMP implements this provision of the ICCAT recommendation through the establishment of the school bluefin tuna reserve (described in Section 3.4.2.1.1), and through annual adjustments to the school bluefin tuna landings and reserve categories as necessary to meet the ICCAT requirement. Given the four-year accounting period, adjustments for estimated overharvest or underharvest of school bluefin tuna will not be restricted to automatic carryover between fishing years. Instead, flexible adjustments may be made to enhance fishing opportunities and the collection of information on a broad range of size classes. NMFS will strive, however, to manage the Angling category fishery so that landings of school bluefin tuna are kept at eight percent of the United States' total bluefin tuna quota on an annual basis. Regardless of the estimated landings in any year, NMFS may adjust the annual school bluefin tuna quota to ensure that the average landings of these fish over each four-consecutive-year period does not exceed eight percent by weight of the total bluefin tuna quota allocated to the United States.

For all other bluefin tuna quota categories, NMFS must adjust quotas on an annual basis to reflect overharvest or underharvest in each category during the previous year. If a quota category or subcategory exceeds its quota or adjusted quota in a particular year, its quota must be reduced by that amount for the following year. In the following year NMFS also may allocate any remaining quota from the Reserve to cover this overharvest, consistent with the criteria described in Section 3.4.1.1.3. The total of the adjusted quotas and the Reserve will be consistent with the ICCAT Rebuilding Program.

Accuracy in quota monitoring in the bluefin tuna fishery is difficult and overharvests are likely. Thus, accounting for overharvests is not intended to "punish" the category that exceeded its quota or adjusted quota or to “reward” other categories that did not exceed their quota or adjusted quota, i.e., other categories will not be allocated extra quota in the event that one category or subcategory's landings quota is reduced to account for an overharvest. The change in the fishing year to June 1 through May 31 should make it easier for NMFS to determine each category's final landings for the previous year, and thus determine each category's initial quota for the following year, as few bluefin landings occur during April and May (in the categories with high catch rates).

The following alternatives describe various allocation scenarios that set the relative percentage of the U.S. quota for the six sectors of the domestic bluefin tuna fishery. Altering the relative allocation between these fishery sectors has the potential to alter the rebuilding trajectory because the different sectors target different size and age classes of bluefin tuna. In addition, changes in allocation would have economic impacts. Each domestic allocation alternative is analyzed based on the ICCAT Rebuilding Program (the final bluefin tuna quota action). The following analysis also presents the relative differences in present values of the domestic allocation alternatives. Table 3.6 presents the range of U.S. bluefin tuna quotas under a range of rebuilding and allocation alternatives.

Table 3.6 Bluefin quotas (in metric tons) under rebuilding and allocation alternatives.

Rebuilding Alternative	Domestic Allocation Alternative	Total West Atlantic (Landing Quota)	Total U.S.	General Category	Angling Category	Harpoon Category	Purse Seine Category	Longline Category	Trap Category	Reserve	Discard Allowance
ICCAT Rebuilding Program (20 Years) - FINAL ACTION	**1. Status Quo**	2,413	1,387	653	273	54	258	113	1	35	68
	2. SQ w/ Purse Seine Cap (FINAL ACTION)	2,413	1,387	653	273	54	250	113	1	43	68
	3. No Small Fish	2,413	1,387	818	0	69	323	141	1	35	68
	4. Reduce Purse Seine 50%	2,413	1,387	743	312	54	129	11			
10-Year Rebuilding Program	**1. Status Quo**	1,913	1,100	518	217	43	204	89	1	28	68
	2. SQ w/ Purse	1,913	1,100	518	217	43	204	89	1	28	68
	3. No Small Fish	1,913	1,100	649	0	55	256	111	1	28	68
	4. Reduce Purse	1,913	1,100	590	247	43	102	89	1	28	68
Status Quo	**1. Status Quo**	2,354	1,344	633	265	53	250	109	1	33	68
	2. SQ w/ Purse	2,354	1,344	633	265	53	250	109	1	33	68
	3. No Small Fish	2,354	1,344	793	0	68	313	136	1	33	68
	4. Reduce Purse	2,354	1,344	721	302	53	125	109	1	33	68

Final Action: Status quo domestic quota allocations, with Purse Seine category capped at 250 mt ww

U.S. domestic quota allocations will be based on the same percentages as the 1997 allocations, but the Purse Seine category will be capped at its 1997/1998 quota of 250 mt ww (see Table 3.7). Anything over 250 mt ww that the Purse Seine category would receive under the percentage allocations will instead be added to the Reserve. Based on these percentages, and overharvest or underharvest in the Angling, General, and Purse Seine categories in 1998, the adjusted quotas for the 1999 fishing year are as follows: 261 mt ww for the Angling category, including 99 mt ww for the school bluefin tuna subquota; 654 mt ww for the General category; 54 mt ww for the Harpoon category; 113 mt ww for the Longline category; one mt ww for the Trap category; 252 mt ww for the Purse Seine category; and 43 mt ww for the Reserve (see Table 3.8).

Vessels using purse seine nets have participated in the U.S. fishery for bluefin tuna continuously since the 1950s, although a number of purse seine vessels did target and land bluefin tuna off of Gloucester, MA as early as the 1930s. The limited entry system with non-transferable individual vessel quotas (IVQs) for purse seining was established in 1982, effectively excluding any new entrants to this category. NMFS considered the relevant factors outlined in section 303(b)(6) of the Magnuson-Stevens Act, which include: (A) present participation in the fishery; (B) historical fishing practices in, and dependence on, the fishery; (C) the economics of the fishery; (D) the capability of fishing vessels used in the fishery to engage in other fisheries; (E) the cultural and social framework relevant to the fishery and any affected fishing communities; and (F) any other relevant considerations. See the description of the Purse Seine category fishery in Chapter 2 for more information on the history of this fishery and for discussion of the preceding factors. Equal quotas are assigned to individual vessels by regulation; the IVQ system is possible in this category given the small pool of ownership in this sector of the fishery. Currently, only five vessels comprise the bluefin tuna Purse Seine fleet, and the quotas were made transferable among the five vessels in 1996.

The combined result of the limited access IVQ system and quota allocation to Purse Seine category vessels is that each owner is essentially assured an annual allocation of 50 mt. Vessel owners in other categories receive no such “guaranteed allocation.” Indeed, the most likely outcome in the open access portions of the bluefin fishery is that most vessels will land less fish as the number of participants increases.

A limited access system for the Longline category fishery for Atlantic tunas is also established in this FMP (see Chapter 4).

Ecological Impacts

Based on the average size for large medium/giant bluefin tuna, the final action will result in an estimated 14,853 bluefin tuna being landed (5,836 $\geq$ 73 inches CFL and 9,017 < 73 inches CFL) each year by the United States throughout the 20-year rebuilding period. This is an estimated increase of 3.4 percent in the number of fish that would be landed under the status quo rebuilding and allocation alternatives, and a very slight increase compared to the number that would be landed with the same rebuilding alternative under the status quo allocation alternative.

The composition of the landings (in numbers of fish) is slightly different from the status quo allocation alternative. Given the 20-year ICCAT Rebuilding Program, the Purse Seine category would be due to receive 258 mt ww using the status quo allocation percentages. As the final action is very similar to the status quo, and the overall U.S. quota in the Rebuilding Program is very similar to the status quo, the impacts on other fish stocks, protected species, and essential fish habitat would be similar to those described in Chapter 2.

Social and Economic Impacts

Combined with the 20-year Rebuilding Plan, the final action results in estimated present values of gross and net revenues for the 1999 to 2038 period which are slightly lower than with the status quo allocation alternative, and are estimated to be $227 million and $92 million, respectively (see Chapter 7). The present value of Angler Consumer Surplus for the final action is the same as under the status quo, and is estimated to be $228 million (see Chapter 7). If the additional quota which is put into the Reserve under the final action goes to commercial or recreational categories, gross and net revenues, and/or Angler Consumer Surplus would increase accordingly.

The social impacts from this final action will be similar to those of the status quo allocation alternative. The extra tonnage allocated to the Reserve will most likely be allocated to those categories that have high participation and/or have closed quickly in recent years (e.g., the Harpoon category) or those which collect information important for stock assessments (e.g., the General and Angling categories), which could relieve conflict in these categories. As with the other allocation alternatives, however, conflict between user groups will most likely continue.

Conclusion

At the HMS AP meeting in August 1998, while no clear consensus emerged, there was little discussion of, or support for, changing the Purse Seine category quota. The HMS AP met in January 1998 to discuss bluefin tuna quota allocations and General category effort controls, and there was strong support for the status quo, although some AP members did support a reduction in the Purse Seine category quota. Both AP discussions occurred in light of a potential reduction of the overall U.S. allocation and therefore to domestic quota category allocations; no increases were anticipated at the time. Public comment on allocation issues was mixed, with some comments on the purse seine allocation issue stating that the category's allocation should be increased, some stating that it should be decreased, as well as some in favor of the cap.

NMFS maintains that limiting the Purse Seine category to its quota level of recent years would not unduly impact that category, with its limited entry IVQ system and limited participants, especially when compared to the intense competition and increased participation in the handgear fisheries. The IVQ system in place, which assigns a set quota to the category and to each vessel, essentially insulates the Purse Seine category from increased competition and participation, and NMFS maintains that limiting the Purse Seine category to 250 mt ww is consistent with the National Standards. However, the AP has not had an opportunity to address this issue in light of the 1999 quota increase, and NMFS would appreciate any insight the AP may provide. Therefore, NMFS is not making a final decision regarding the allocation of the 8 mt potential Purse Seine category quota increase for 1999 at this time; instead, NMFS will hold the 8 mt in the Reserve until after the AP has discussed the issue. If NMFS retains the 250 mt cap as proposed, no further modifications to this FMP will be made. If, however, NMFS does not retain the Purse Seine category quota cap, the FMP will be modified through the framework provisions contained herein.

Table 3.7 Domestic Quota Allocation Percentage Alternatives

Category	Status Quo Allocation	Status Quo with Purse Seine Cap*	Eliminate Small Fish	Reduce Purse Seine 50%
General	47.1	47.1	59.0	53.6
Angling	19.7	19.7	0.0	22.5
Purse Seine	18.6	18.6*	23.3	9.3
Harpoon	3.9	3.9	5.0	3.9
Longline	8.1	8.1	10.1	8.1
Trap	0.1	0.1	0.1	0.1
Reserve	2.5	2.5*	2.5	2.5

*Purse Seine category receives 250 mt ww or 18.6% of quota, whichever is less. Any part of 18.6% above 250 mt ww is allocated to the Reserve.

Table 3.8 1998 Bluefin Quotas, Landings, and Under/Overharvest; 1999 and Future Quotas (mt ww).

	A	B	C	D	E	F	G	H
	Categories	1998 Initial quota	1998 Adjusted quota	1998 Landings	1998 Under (+)/ Overharvest (-) (January-December)	1999 Bridge Quota (Jan-May)	1999-2018 Fishing Year Quota* (June-May)	Adjusted 1999 Fishing Year Quota (June-May)
ANGLING	School (N)[1]	57	66	44[a]	-12	0	48	43
	School (S)[2]	51	26	60[a]			42	38
	Lg School/ Sm Med (N)	81	61	45[a]	16	16	83	83
	Lg School/ Sm Med (S)	72	90	31[a]	59	59	73	73
	Trophy (N)	3	3	<1	2	0	2	2
	Trophy (S)	5	5	3	2	4	4	4
COMMERCIAL	General	657	707	706	1	0	653	654
	Longline (N)[3]	24	24	23	1	1	24	24
	Longline (S)[4]	89	49	24	25	25	89	89
	Trap	1	1	1	0	0	1	1
	Purse Seine	250	250	248	2	0	250	252
	Harpoon	53	60	60	0	0	54	54
	Reserve	52	16	1[b]	15	15	43	43
	School Reserve	---	---	---	---	0	21	18
	TOTAL	**1,395**	**1,358**	**1,247**	**112**	**120**	**1,387**	**1,378**

[a] As of November 6, 1998 (includes school bluefin tuna used for research and landings reported through North Carolina pilot program)

[b] Includes non-school bluefin tuna used for research and bluefin tuna seized by Enforcement

*Does not include 68 mt ww discard allowance

[1]Angling category northern area is defined as waters north of 38 47'

[2] Angling category southern area is defined as waters south of 38 47'

[3]Longline category northern area is defined as waters north of 34 00'

[4]Longline category southern area is defined as waters south of 34 00'

Rejected Options for Bluefin Tuna Domestic Allocation Alternatives

Rejected Option: Status quo domestic quota allocation of bluefin tuna

Ecological Impacts

The number of fish projected to be landed under the status quo allocation alternative with the various rebuilding alternatives are described in the ecological impact analyses of the quota alternatives in Section 3.4.1.1.1. Based on the 20-year Rebuilding Program and the average sizes for school, large school/small medium, and large medium/giant bluefin tuna, this alternative would result in an estimated 14,808 bluefin tuna being landed by the United States (5,857 ≥ 73 inches CFL and 8,951 < 73 inches CFL) each year until stock rebuilding is complete. This is equivalent to a 3.1-percent increase in numbers of fish landed in the west Atlantic by the United States, compared to landings levels under the status quo rebuilding alternative.

As this allocation alternative is the status quo, and the overall U.S. quota during the rebuilding period is very similar to the status quo, impacts on other fish stocks, protected species, and essential fish habitat are described in Chapters 5 and 6.

Social and Economic Impacts

Bluefin prices and harvesting costs vary by sector. As a result, altering the allocation among these sectors would have effects on gross and net bluefin tuna revenues. However, gross and net bluefin tuna revenues are even more strongly influenced by the choice of rebuilding alternative. The analysis of the economic impacts of this allocation alternative is based on the provisions of the 20-year Rebuilding Plan.

The estimated present value of gross and net revenues for the 1999 to 2038 period are estimated to be $229 million and $92 million, respectively (see Chapter 7). The present value of Angler Consumer Surplus for this alternative is estimated to be $228 million (see Chapter 7).

The status quo social environment of the bluefin tuna fishery in the United States is described in Chapter 2 and Chapter 9. In past rulemaking, constituents have requested changes to the allocation system, including reallocation of Purse Seine quota to the handgear categories, reallocation of General category quota to the Angling category, and elimination of the small bluefin tuna fishery. Public comment is often emphatic from both the commercial and recreational sectors, and these debates would likely continue under other quota allocation alternatives as well.

Conclusion

There is currently conflict between various user groups, and this allocation alternative would likely result in continued conflict as it is the status quo and is consistent with past allocations.

Rejected Option: Elimination of the small fish quota for bluefin

This quota allocation alternative would eliminate the Angling category quota for bluefin tuna and redistribute it to the other quota categories based on their current percentage allocation. See Tables 3.6 and 3.7 for the percentage quota distributions and metric tonnage for each category under this alternative. Analyses conducted using the 1996 stock assessment suggest that this alternative could result in rebuilding in slightly less time than under the status quo allocation.

Ecological Impacts

This alternative would eliminate the landing of school and large school/small medium bluefin tuna. Based on the average size for large medium/giant bluefin tuna, and the 20-year Rebuilding Program, this allocation alternative would result in an estimated 7,368 bluefin tuna being landed each year by the United States until stock recovery to the spawning stock biomass necessary to produce maximum sustainable yield on a continuing basis, a reduction of 49 percent in the number of fish which would be landed under the status quo rebuilding alternative. This alternative would result in 50 percent fewer fish landed by number (although the same amount of fish landed by weight), compared to what would be landed under the status quo allocation alternative.

This allocation alternative would be expected to provide the fastest rebuilding over the long term, and could ultimately provide for a higher overall quota. While analyses have not been conducted using data from the 1998 stock assessment, past analyses indicate that rebuilding would occur slightly faster (two to five years faster than under status quo allocation) with elimination of mortality in the small fish fishery, all else remaining equal. However, the elimination of the small fish fishery for bluefin tuna could have a negative impact on other fish stocks, particularly other HMS such as yellowfin tuna, north Atlantic albacore tuna, and sharks, as the displaced recreational effort shifts.

The rod and reel fishery for small bluefin tuna (Angling category) is the only fishery which targets juvenile bluefin tuna. Eliminating this fishery would eliminate the only source of catch per unit effort data for these age classes of bluefin tuna. Catch per unit effort data and indices are important factors used in the stock assessments conducted by SCRS.

Social and Economic Impacts

Since the traditional mid-Atlantic recreational bluefin tuna fishery has not been a catch and release fishery, a no-retention provision would substantially reduce angler consumer surplus from the small fish fishery. As indicated above, the present value of Angler Consumer Surplus is estimated to be $228 million under the status quo allocation alternative and the 20-year rebuilding program. However, the present value of commercial gross and net bluefin tuna revenues for the 20-year rebuilding period would increase if the small fish fishery were eliminated. The present values would be $288 million and $116 million, respectively, representing increases of $58 and $24 million over commercial gross and net bluefin tuna revenues under the status quo domestic allocation. The net effect on present values would still be negative under this alternative since the reduction in angler consumer surplus is only partially offset by the increase in present value from the commercial fishery.

There would be significant negative social impacts on the recreational fishing community as this alternative would eliminate the fishery for school, large school, and small medium bluefin tuna. The impact could be just as severe for the charterboat industry if recreational fishing opportunities are reduced and clients choose not to make fishing plans, thus reducing charter/headboat revenues and income. Commercial fishermen and their communities would benefit from this alternative because their allocation percentages would increase. There would most likely be increased conflict between the various user groups over quota allocation issues, as the recreational fishing community would seek to regain a share of the quota.

Conclusion

This alternative is rejected because it would not provide for harvesting optimum yield. It is also inconsistent with NS 8 because it would not provide for the sustained participation of fishing communities, to the extent practicable. The limited retention of pre-spawning bluefin tuna by recreational and commercial fishermen has been an integral part of this fishery throughout its history and is a part of the fishery's future. If managed appropriately, these fish can continue to afford sustained fishing opportunities without adversely affecting the stock. The adverse social and economic impacts on the recreational and charter/headboat sectors from this alternative result in its rejection. Further, this alternative would hinder NMFS' ability to collect the best available data on the catches of the broadest range of age classes possible for assessment of the west Atlantic stock, as required by the 1998 ICCAT Recommendation.

Rejected Option: 50-percent reduction in Purse Seine category allocation, with maintenance of limited access in purse seine fishery

This quota allocation alternative would reduce the Purse Seine allocation by 50 percent and redistribute that quota to the General and Angling categories based on their current percentage allocation. This alternative, while it would reduce the quota allocated to the Purse Seine category and the individual vessels in it, would maintain the IVQ limited access management system that is currently in place. See Tables 3.6 and 3.7 for the percentage quota distributions and metric tons for each category under this alternative.

Ecological Impacts

This alternative redistributes some of the quota which would have been landed as mature fish by Purse Seine category vessels to the recreational fishery for immature fish, and would result in a greater number of fish landed than with the other allocation alternatives. Rebuilding could be slower than under the status quo allocation alternative. The size composition of the landings, under each rebuilding alternative, would not be significantly different from that under the status quo allocation, however, and the pace of rebuilding under this allocation alternative would most likely be very similar to those under status quo allocations.

Based on the average size for the large medium/giant bluefin tuna, combined with the 20-year ICCAT Rebuilding Plan, this allocation alternative would result in an estimated 15,227 bluefin tuna being landed (5,565 $\geq$ 73 inches CFL and 9,572 < 73 inches CFL) each year by the United States until stock rebuilding is complete, an increase of six percent in the number of fish which would be landed under the status quo rebuilding and allocation alternatives, and a slight increase compared to the number that would be landed with a similar rebuilding time period under the status quo allocation alternative.

Social and Economic Impacts

This allocation alternative would result in an overall decrease in the present value of gross and net bluefin tuna revenues to $217 million and $85 million, respectively, as compared to the status quo allocation. The decrease results in part from the fact that both gross and net revenues per ton are lower for the General category, which would be reallocated some of the purse seine quota, than for the Purse Seine category. In addition, a portion of the purse seine quota would be allocated to the Angling category. As a result, the present value of Angler Consumer Surplus would increase from the status quo allocation to $261 million.

This alternative would impact the purse seine fishery severely under any of the rebuilding alternatives. There are a limited number of people who benefit from the purse seine quota, and, while the fishery has continued despite past reductions in quota, it is unclear if those people would leave the fishery if their quota allocation percentage were to be reduced (see Section 2.5.4). The General and Angling categories would benefit from this allocation alternative under any of the rebuilding alternatives. For instance, more General and Angling category fishermen could retain their permits and continue participating in the bluefin tuna fishery than might otherwise under the ten- or 20-year rebuilding alternatives. There would most likely be continued conflict between the various user groups over quota allocation issues.

Conclusion

This alternative is rejected because of the adverse social and economic impacts it would have on the Purse Seine sector of the bluefin tuna fishery, and because it would not maintain traditional fishing patterns as required by the Magnuson-Stevens Act.

3.4.1.1.3 Bluefin Tuna Quota Transfer Criteria

NMFS has the authority to allocate any portion of the Reserve to any category or categories of the fishery after considering the following four factors: 1) the usefulness of information obtained from catches of the particular category of the fishery for biological sampling and monitoring the status of the stock; 2) the catches of the particular gear segment to date and the likelihood of closure of that segment of the fishery if no allocation is made; 3) the projected ability of the particular gear segment to harvest (land) the additional amount of bluefin tuna before the anticipated end of the fishing season; and 4) the estimated amounts by which quotas established for other gear segments of the fishery might be exceeded.

NMFS is also authorized to make adjustments to quotas involving transfers between categories if, during a single year quota period, it is determined, based on landing statistics, present year catch rates, effort, and other available information, that any category is not likely to take its entire quota as previously allocated for that year. Given that determination, NMFS may transfer inseason any portion of the quota of any fishing category to any other fishing category after considering the four factors listed above.

Final Action: Add "Effects on Rebuilding and Overfishing" as a factor to consider when allocating Reserve or transferring bluefin tuna quota between categories

This action adds a fifth factor for NMFS to consider before allocating any portion of the Reserve to any category or categories of the bluefin tuna fishery, or before NMFS transfers any portion of the quota of any fishing category to any other fishing category. The fifth factor that NMFS will need to consider is: the anticipated consequences of the quota transfer on rebuilding and overfishing.

Ecological Impacts

Consideration of rebuilding and overfishing implications when making inseason transfer decisions could result in faster rebuilding for west Atlantic bluefin tuna, consistent with the precautionary approach to fisheries management. This factor will most likely need to be considered in the context of transfers to the Angling category fishery for juvenile bluefin tuna. While consistent with the current ICCAT recommendations, increasing the catch of juvenile bluefin tuna in the west Atlantic could slow rebuilding; however, the Angling category fishery for juvenile bluefin tuna is the only source of scientific monitoring information (catch per unit effort and biological samples) on these age classes of bluefin tuna. Catch per unit effort data and indices are important factors used in the stock assessments conducted by SCRS, and biological samples are used for research on stock structure and life history of the species. Fishery managers must strive for a balance between scientific monitoring and rebuilding objectives in making quota transfers, and inseason transfers to and from the Angling category may still be made.

Social and Economic Impacts

Reducing the catch of juvenile bluefin tuna in the west Atlantic would help speed rebuilding. This final action could prevent excessive transfers to the Angling category fishery for juvenile bluefin tuna, which could result in reduced fishing opportunities, revenues, and angler consumer surplus for the private recreational and charter/headboat fleet fishing for bluefin tuna.

Conclusion

West Atlantic bluefin tuna is overfished, and one of the driving forces behind this FMP is to end overfishing and rebuild overfished stocks. Adding the additional criteria that NMFS must consider, among other factors, the consequences of a bluefin tuna quota transfer on rebuilding and overfishing before allocating quota from the Reserve or transferring bluefin tuna quota between categories is consistent with the objectives of this FMP, the requirements of the Magnuson-Stevens Act and the NSGs, and the precautionary approach to fisheries management.

Rejected Options for Bluefin Tuna Quota Transfer Criteria

Rejected Option: Status quo for bluefin quota transfer criteria

When the regulations regarding allocation from the Reserve and transfer between quota categories were first implemented, NMFS did not include consideration for a rebuilding program because there was no rebuilding program in place, nor was there a statutory requirement for a rebuilding program. These circumstances have changed, and the requirements of the Magnuson-Stevens Act as well as the objectives of this FMP emphasize the need to rebuild overfished stocks. Thus, the current regulations are no longer preferred. Given the need to take into account potential effects on rebuilding when transferring quota, this alternative is rejected.

Rejected Option: Limit bluefin quota transfers to any category to 20 percent of that category's original quota

This alternative would limit the amount to bluefin tuna that could be transferred from the Reserve and/or another quota category to any quota category (other than the Purse Seine category, which is capped at 250 mt) to 20 percent of that category's original quota. For example, if the Harpoon category's quota were 54 mt ww, the maximum that could be transferred to that category through inseason actions for a particular year would be 10.8 mt ww (20 percent of 53 mt ww). Any additional landings, beyond this 20 percent transfer limit, would have to be subtracted from that category's quota in the following year.

Ecological Impacts

This alternative could have positive impacts on the west Atlantic bluefin tuna stock as it would prevent excessive quota transfers to categories where increased catch could slow rebuilding, as discussed under the final action. This could result in faster rebuilding and stricter adherence to the precautionary approach.

Social and Economic Impacts

This alternative would prevent excessive transfers to all bluefin tuna quota categories. This could result in a quota category not receiving a quota transfer to cover overharvest, which could result in that category having quota deducted the following year. This could result in reduced fishing opportunities, income, and/or Angler Consumer Surplus for the commercial and/or recreational fleet fishing for bluefin tuna. This alternative also may limit NMFS' ability to transfer quota as necessary to ensure full use of the domestic bluefin tuna quota.

Conclusion

This alternative is rejected at this time, although NMFS encourages further discussion of this issue from the HMS AP and the public. West Atlantic bluefin tuna is overfished, and one of the driving forces behind this FMP is to end overfishing and rebuild overfished stocks. Adding additional limitations on bluefin tuna quota transfers could have positive effects on rebuilding the west Atlantic bluefin tuna stock.

3.4.1.1.4 Bigeye Tuna Quota Alternatives

ICCAT has not yet adopted quotas for bigeye tuna, and the international management measures for bigeye tuna are not currently implemented as a coordinated rebuilding program as defined by the Magnuson-Stevens Act. However, ICCAT has recognized the danger that could be presented by the recent increase in bigeye tuna catches, especially increased landings of fish less than the minimum size by non-U.S. vessels in the equatorial fishery. SCRS has determined that under the current exploitation patterns, and assuming recruitment at recent average levels, yields of bigeye tuna are expected to decline in the near future to levels below the maximum sustainable yield. At the November 1998 meeting of ICCAT, the United States introduced a resolution that requests SCRS to develop rebuilding scenarios for bigeye tuna, based on the available data. A bigeye tuna stock assessment is not scheduled for 1999, but will likely be held in 2000 or 2001.

Due to the very limited U.S. share of the international fishery for bigeye tuna, a unilateral rebuilding plan would not be expected to have a measurable effect on the stock. Additionally, any unilateral action on behalf of the United States that would deprive U.S. fishermen of access to the bigeye tuna resource might not reflect traditional participation by U.S. fishermen relative to foreign competitors, and thus could be contrary to § 304(e) of the Magnuson-Stevens Act. The United States is responsible for only one percent of Atlantic-wide bigeye landings; thus, the rebuilding plan for bigeye tuna will rely heavily on international cooperation and compliance with management measures.

Final Action: Establish the foundation for developing an international ten-year rebuilding program for Atlantic bigeye tuna

This final action establishes the foundation that can be used in negotiations with ICCAT to develop a ten-year rebuilding program for overfished Atlantic bigeye tuna, including targets for recovery, fishing mortality rate limits, and explicit interim milestones expressed in terms of measurable improvements of the stock. If successful, an Atlantic-wide TAC for bigeye tuna, along with other conservation and management measures, will be adopted by ICCAT to rebuild the stock. The United States would then implement the ICCAT Rebuilding Program for bigeye tuna through quotas and/or increased minimum sizes and retention limits in the domestic fishery.

SCRS has determined that a reduction in Atlantic-wide catch of bigeye tuna, along with a reduction in the proportion of catches less than the minimum size, could result in recovery to maximum sustainable yield within ten years (Figure 9, SCRS, 1998). If possible, given international considerations and the rebuilding scenarios that will be developed by SCRS based on the best available scientific information on the status of the stock, NMFS seeks a ten-year rebuilding program for bigeye tuna.

The Magnuson-Stevens Act and NSGs provide guidance for managers to accommodate the limitations imposed by being a member of an international body whose management recommendations may not readily conform to a ten-year rebuilding time frame. Under this action, the United States will adopt a rebuilding program for bigeye tuna as recommended by ICCAT. However, implementation of this alternative will depend on a thorough analysis of the ICCAT Rebuilding Program to ensure that it includes a specified recovery period, biomass targets, fishing mortality rate limits, and explicit interim milestones expressed in terms of measurable improvement of the stock. Each of these components is necessary to support the objectives of this FMP and the intent of the Magnuson-Stevens Act.

Ecological Impacts

SCRS has strongly recommended a reduction in the total catch of Atlantic bigeye tuna to the 1992 level, which was approximately 85,000 mt ww (SCRS, 1998). If this scientific recommendation were to be adopted by ICCAT, it would require at least a six percent reduction from the 1997 Atlantic-wide level of bigeye catch. In the United States, reported landings of bigeye in 1997 (1,095 mt ww) would need to be reduced to 1,029 mt ww in order to achieve a six percent reduction in catch. It should be noted that U.S. commercial and recreational landings figures for BAYS tunas, including bigeye tuna, are under active review, which may result in changes to landings estimates.

Another critical part of a recovery plan for bigeye tuna is a reduction in the catch of fish less than the minimum size. As noted in Chapter 2, approximately 70 percent of the Atlantic-wide bigeye catch is composed of fish smaller than 3.2 kg (seven pounds), even though ICCAT allows only a 15-percent tolerance for fish smaller than this size. The United States has already addressed this problem in the domestic fishery by implementing a minimum size of 27 inches CFL (approxi-mately 6.4 kg) with zero tolerance. The rebuilding plan for bigeye tuna should address this problem at the international level. This could be accomplished through limitations on the use of fish aggregating devices in the surface fisheries near the equator, as recommended by SCRS.

Because a mixed species pelagic longline fishery is the main commercial fishery in the United States for bigeye tuna, the implementation of a new quota system could increase discards of bigeye tuna. In addition, as the stock recovers and abundance increases, increased discards of bigeye could occur. Alternatives addressing incidental catch and discard reduction are discussed later in this chapter. A reduction in landings of bigeye tuna could also cause a shift in both commercial and recreational fishing effort, and perhaps mortality, towards other species. Overall, however, this action will result in positive ecological impacts on the stock because current catch rates exceed the levels needed to produce the maximum sustainable yield.

Social and Economic Impacts

As ICCAT has not yet adopted a rebuilding program for bigeye tuna, a complete analysis of the social and economic impacts of this alternative cannot be conducted at this time. If the ICCAT Rebuilding Program involves a substantial reduction in allowable catch, there would likely be a short-term reduction in economic benefits from the fishery until the stock recovers. For instance, if ICCAT established an Atlantic-wide TAC at 1992 levels, a six percent reduction in commercial landings would result in a similar reduction in revenues. U.S. commercial landings of bigeye tuna in 1997 were 803 mt ww, with an average price of $3.53 per pound dw, for a total ex-vessel value of approximately five million dollars. A six percent reduction in revenues could result in an ex-vessel value of approximately $4.7 million. Estimated recreational landings of bigeye were 293 mt ww, so a six-percent reduction in landings would limit the recreational fishery to 275 mt ww. Since bigeye tuna are not often targeted by recreational fishermen, except in certain times of the year and in certain areas, it is difficult to estimate the effect that a reduction in allowable landings of bigeye would have on angler consumer surplus. It would most likely be reduced, but to an unknown extent, since many recreational trips targeting bigeye tuna may also target yellowfin tuna.

As described in Chapters 4, 7, and 9, the pelagic longline fleet is under considerable strain due to increasingly stringent regulations, market difficulties and problems in securing and retaining trained crew members. Bigeye tuna can be a profitable catch, since prices of export-quality fish can be nearly as high as prices for bluefin tuna. Numerous vessels in the pelagic longline fishery are operating on narrow profit margins. Management measures that further restrict this fishery through large quota reductions or closures could affect fishing communities, particularly those in the pelagic longline fishery in the mid-Atlantic region. There are not expected to be any significant safety implications associated with this action. Although a landings quota could increase the derby nature of the pelagic longline fishery, NMFS is implementing a limited access program that would mitigate those impacts.

Conclusion

This is the final action. An international rebuilding plan for bigeye tuna is the most effective alternative for meeting the conservation objectives of NS 1, while taking into account impacts on fishing communities. Implementation of this final action will depend on an analysis of any rebuilding program that is adopted by ICCAT. NMFS will work with ICCAT member nations to develop and adopt an appropriate international rebuilding plan for bigeye tuna. In order to be consistent with the requirements of the Magnuson-Stevens Act, the rebuilding program must include a specified recovery period, biomass targets, fishing mortality rate limits, and explicit interim milestones.

Rejected Options for Bigeye Tuna Quota Alternatives

Rejected Option: Status quo: No rebuilding plan for bigeye tuna

Under this alternative, the management scheme currently in place for Atlantic bigeye tuna, including that for the United States, would remain the same. The basic conservation recommendation of ICCAT in place for bigeye tuna is a minimum size of 3.2 kg (7 pounds). Seventy percent of current catches Atlantic-wide, however, consist of bigeye tuna smaller than this minimum size. Spanish and French purse seine fleets have agreed to limit fishing on schools of bigeye tuna associated with floating objects, which should reduce the catch of juveniles. A resolution limits catches of Atlantic bigeye tuna by Chinese-Taipei to 16,500 mt ww. ICCAT also approved a binding recommendation that requires all member countries to report their vessels greater than 80 GRT that are fishing for bigeye tuna in the Atlantic Ocean. ICCAT has not recommended Atlantic-wide or national quotas for bigeye tuna, nor has it investigated recovery scenarios, although at the November 1998 meeting, ICCAT adopted a resolution requesting SCRS to develop rebuilding scenarios for bigeye tuna.

Ecological Impacts

The 1998 SCRS report states that under current exploitation pattern and recruitment levels, yields of bigeye tuna would be expected to decline in the near future to levels below maximum sustainable yield. Current catch levels cannot be sustained, and without additional management measures, may result in substantial declines in stock size.

Social and Economic Impacts

If current catches cannot be sustained and result in substantial stock declines, there could be significant negative social and economic impact to vessels and communities involved in the U.S. bigeye tuna fishery. Commercial catches and revenues, along with recreational catches and fishing opportunities, would decline, resulting in lower revenues and perhaps in lower angler consumer surplus.

Conclusion

This alternative is rejected. The Magnuson-Stevens Act requires the development of rebuilding plans for all species that are listed by NMFS as overfished. Bigeye tuna was added to the list of overfished fisheries in October 1998. NMFS is committed to multilateral efforts to develop an international rebuilding plan for bigeye tuna.

3.4.1.2 North Atlantic Swordfish

North Atlantic swordfish are considered overfished. Current biomass is estimated to be less than that needed for maximum sustainable yield and the fishing mortality rate exceeds that which would produce maximum sustainable yield (Chapter 2). ICCAT recommendations for north Atlantic swordfish include minimum sizes, quotas, and compliance measures, although these measures are not currently implemented as a coordinated rebuilding plan as defined by the Magnuson-Stevens Act. In this FMP, the United States establishes the foundation for negotiating an ICCAT Rebuilding Program for north Atlantic swordfish in 1999. The rebuilding plan may include quota reductions, measures to account for all sources of mortality, and other conservation and management measures, as appropriate.

3.4.1.2.1 North Atlantic Swordfish Quota Alternatives

Reducing Quotas to Rebuild the North Atlantic Swordfish Stock

In this FMP, analyses of the rebuilding alternatives for the north Atlantic swordfish stock are based on the results of the 1996 SCRS stock assessment. In 1996, SCRS reported that total swordfish biomass corresponding to the level that would produce maximum sustainable yield in the north Atlantic may not be achieved in five or ten years without substantial reductions in catch from 1996 levels. In response to the 1996 stock assessment, ICCAT implemented a substantial reduction in quotas for 1997 through 1999. SCRS has maintained that the level of harvest needs to be further reduced below the level of replacement yield in order to rebuild the stock. In 1998, the swordfish recruitment index showed substantially improved recruitment in 1997. However, the replacement yield for 1997 is likely to be about 8,000 to 12,000 mt and catch levels remain above projected replacement yield levels (SCRS, 1998a).

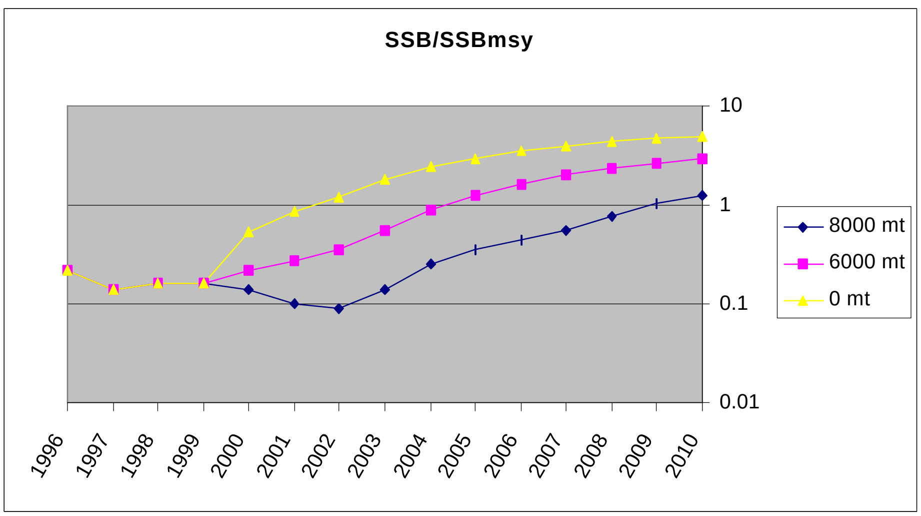
The 1996 assessment included projections of SSB/SSB_{MSY} under a variety of scenarios for the 1997 to 2010 period. These scenarios assume constant catch, however, which is not valid given the decreasing swordfish catches in recent years. As shown in Table 3.9, reported swordfish catch declined from 1995 to 1997. If there is compliance with ICCAT quota reductions, catch should continue to decline in 1998 and 1999. Thus, it is impossible to obtain projections directly from the 1996 SCRS report because it assumes constant catch levels over this period.

Table 3.9 Reported Atlantic-wide catch (landings and discards) of North Atlantic Swordfish 1990 to 1997, in mt whole weight (Source: SCRS, 1998a)

	1990	1991	1992	1993	1994	1995	1996	1997
North Atlantic Swordfish Catch	15,672	14,716	15,005	16,350	14,501	16,026	14,208	12,510

The low-ends of the 80 percent confidence interval estimates were used (Table 17, SCRS, 1996a) to adjust the SCRS ADAPT projections. The results of the ADAPT projections were adjusted based on reported and estimated catches for the 1996 to 1998 period, information that was unavailable at the time of the 1996 SCRS report. This precautionary approach resulted in conservative estimates of the impact of the quotas considered. In essence, these adjustments shifted the curves shown in Figure 3.2 down from where they are in the SCRS report. Again, these adjustments were deemed necessary because the constant catch assumptions in the 1996 SCRS projections are no longer valid. For example, the 8,000 mt ww TAC projections contained in the SCRS report assume this catch level for 1996 to 1998, yet the actual TAC, and thus the reported and estimated catches for this period, are significantly higher than this level. To more accurately reflect real 1996 to 1998 catches, the 8,000 mt ww TAC projections were adjusted downward, resulting in the rebuilding trajectory shown in Figure 3.2. Similar adjustments were made to the 6,000 mt ww and zero mt ww rebuilding trajectories.

Figure 3.2 Projected SSB/SSB_{MSY} for north Atlantic swordfish for 1999 to 2008 under constant-catch scenarios (based on SCRS projections and adjusted by NMFS)



Using the adjusted stock assessment projections, three constant-catch scenarios were analyzed for the 1999 to 2008 period: zero mt/year; 6,000 mt ww/year, and 8,000 mt ww/year. Figure 3.2 plots the projected SSB/SSB_{MSY} for 1999 to 2008 under constant-catch scenarios. "Quotas" in this analysis are considered as total allowable catch, i.e., removal of swordfish from the stock either by landing or discarding dead swordfish.

In 1999, SCRS will reassess the status of north Atlantic swordfish, using data through 1998, and will provide ICCAT with a range of recovery scenarios. Updated relative abundance analyses completed in 1998 indicated substantially improved recruitment of swordfish in 1997 (SCRS, 1998a). This improvement, should it prove to be real over time (and not an artifact of one year's worth of data), could allow for increases in spawning biomass in the future. However, SCRS expressed concern about the high catches (landings and discards) of small swordfish in 1997, which could prevent a strong year-class from reaching maturity. The 1999 assessment may provide a more optimistic outlook than that indicated in the 1996 assessment, if this year class is not heavily harvested until it reaches maturity (SCRS, 1998a). The United States will consider the rebuilding scenarios developed by SCRS in 1999, as well as the comments that were received on the alternatives presented here (in terms of time frames and rationale, not absolute numbers) when developing the swordfish rebuilding plan.

Final Action: Establish the foundation for developing an international ten-year rebuilding program for north Atlantic swordfish

This final action establishes the foundation that can be used in negotiations with ICCAT to develop a ten-year rebuilding program for overfished north Atlantic swordfish, including targets for recovery, fishing mortality rate limits, and explicit interim milestones expressed in terms of measurable improvements of the stock. If successful, the TAC for north Atlantic swordfish would be reduced, and other conservation and management measures may be adopted, in order to rebuild the stock. The United States would then implement the ICCAT Rebuilding Program for north Atlantic swordfish through adjusted quotas and/or additional conservation and management measures in the domestic fishery.

Historically, the United States has been a leader in conservation of Atlantic swordfish, and has demonstrated the willingness to take the critical steps necessary to conserve these stocks. This fact has been a primary negotiation tool at ICCAT, and it is questionable whether the recent ICCAT actions would have been possible without the support by the United States. The United States sponsored a resolution at the 1998 ICCAT meeting that requests SCRS to develop recovery scenarios for overexploited stocks following the 1999 swordfish stock assessment. Instead of focusing on quota levels, NMFS prefers a plan that emphasizes the rebuilding period. NMFS seeks to rebuild the north Atlantic swordfish stock in ten years, consistent with the Magnuson-Stevens Act (swordfish could rebuild in less than ten years at zero fishing mortality). Following the 1999 stock assessment, NMFS will take into account international considerations and the best scientific information available on the status of the stock in developing an appropriate rebuilding plan for consideration at ICCAT in November 1999.

The Magnuson-Stevens Act and National Standards provide guidance for managers to accommodate the limitations imposed by being a member of an international body whose management recommendations may not readily conform to a ten-year rebuilding time frame. Under this action, the United States will adopt a rebuilding program for north Atlantic swordfish as recommended by ICCAT. However, implementation of this alternative will depend on an examination of the ICCAT Rebuilding Program, including a specified recovery period, biomass targets, fishing mortality rate limits, and explicit interim milestones expressed in terms of measurable improvement of the stock. Each of these components is necessary to support the objectives of the FMP and the intent of the Magnuson-Stevens Act.

Ecological Impacts

Under this final action, NMFS establishes the foundation for an ICCAT Rebuilding Program that would result in a ten-year recovery period for north Atlantic swordfish. Based on the 1996 stock assessment, the north Atlantic TAC for swordfish would need to be reduced to 8,000 mt ww per year for ten years beginning in 2000 in order to rebuild the stock within ten years. The current U.S. share is 29 percent of the TAC, which would amount to 2,320 mt ww during the ten-year rebuilding period, although relative shares for each country are subject to negotiation at ICCAT. This annual TAC of 2320 mt ww each year for ten years does not include any reductions for dead discards. Based on currently available data, this alternative would represent a 27-percent decrease in catch for the north Atlantic and for the United States.

The final action may likely result in an increase in swordfish discards if pelagic longline fishermen continue to fish for tunas during a directed swordfish closure, although bycatch limits during a directed fishery closure should mitigate such effects. In addition, reductions in swordfish quotas may cause shifts in effort to other pelagic species such as dolphinfish, tunas, and wahoo; and some decrease in unmarketable species typically discarded in the directed pelagic longline fishery for swordfish. If this action results in reduced fishing effort by the pelagic longline fleet, interactions with turtles and marine mammals and other bycatch species may decrease. However, if fishermen target other species with their pelagic longlines, sea turtle and billfish catch may increase as fishing is likely to take place during the day or late evening, when bycatch rates of these some species may be higher. Overall, this action will have a positive ecological impact on the north Atlantic swordfish stock because current catch rates exceed levels needed to produce the maximum sustainable yield.

Social and Economic Impacts

As ICCAT has not yet adopted a recovery program, an analysis of the impacts of the program can not be performed at this time. An ICCAT Rebuilding Program that reduces the allowable catch could cause a short-term reduction in economic benefits from the fishery. Should ICCAT develop and adopt a swordfish rebuilding program with specific time periods, milestones, targets, and limits, NMFS will perform full analyses of its expected ecological, economic, and social impacts.

Current estimates of the negative gross and net revenue impacts for the rebuilding years are large, reflecting a quota cut of approximately 27 percent from 1998 levels. Annual gross ex-vessel revenues are estimated to be approximately $11.4 million for a ten-year rebuilding period. Net revenues are estimated to be $1.5 million for the same period. Present values of swordfish gross and net revenues for the domestic fishery are estimated to be slightly lower under this action than under a six-year rebuilding program and slightly higher than under a three-year rebuilding program (Chapter 7).

As a result, it is likely that some vessels that rely heavily on swordfish revenues would be forced to seek revenues in other fisheries or exit fishing altogether. However, this alternative allows for rebuilding in the longest time period allowed by the Magnuson-Stevens Act and the National Standard Guidelines, and the dislocation of fishing effort would be far smaller than under more restrictive rebuilding alternatives. Fisheries to which displaced swordfish effort could viably be redirected would vary by region and type of gear owned by the boat, but might include: increased targeting of BAYS tunas by pelagic longline vessels, participation in the snapper-grouper fishery, and participation in the mackerel, squid and butterfish fisheries, although many of these fisheries also have limited access provisions in place.

As described in Chapters 4, 7, and 9, the pelagic longline fleet is under considerable strain due to increasingly stringent regulations, market difficulties, and problems in securing and retaining trained crew members. Numerous vessels are operating on very narrow profit margins. Measures that further restrict this fishery, through large quota reductions or closures, will affect more than just the marginal vessels. This measure could affect fishing communities, particularly those in the mid-Atlantic, southeast United States, and the Gulf of Mexico.

There are no significant safety implications associated with this action. Reduced quotas could increase derby conditions in the fishery, although pelagic longline fishermen could choose to modify their fishing behavior in order to “target” other species during daytime sets.

Conclusion

This alternative is selected. Many comments were received that supported this final action. An ICCAT Rebuilding Program is the most effective alternative for meeting the conservation objectives of NS 1, while taking into account impacts on fishing communities. Implementation of this final action will depend on an analysis of any rebuilding program that is adopted by ICCAT. NMFS will work with ICCAT member nations to develop and adopt an appropriate rebuilding plan for north Atlantic swordfish. In order to be consistent with the requirements of the Magnuson-Stevens Act, the rebuilding plan must include a specified recovery period, biomass targets, fishing mortality rate limits, and explicit interim milestones expressed in terms of measurable improvement of the stock.

Final Action: Establish the foundation to count dead discards against the swordfish quota

Currently, dead discards of swordfish are not counted against the swordfish quota, and the quota corresponds directly to landings. Dead discards by U.S. commercial fishing vessels are tabulated and reported to ICCAT, and are considered in SCRS stock assessments. Other nations have implemented a higher minimum size than the United States, and, under the ICCAT recommendation, may retain up to 15 percent of their catch in swordfish smaller than that minimum size. Despite the fact that no nations other than the United States and Canada report dead discards of swordfish, it is likely that dead discards do occur when vessels of other contracting parties reach their 15-percent tolerance of undersized fish (although some nations exceed this allowance).

The United States introduced a resolution to ICCAT in 1998 that directs SCRS to take dead discards into account when developing rebuilding scenarios for north Atlantic swordfish. The United States cannot adjust the amount of swordfish landed by subtracting dead discards unilaterally because it would have the effect of reducing the quota, which is inconsistent with ATCA. This final action establishes the foundation for developing measures to count dead discards of swordfish against the quota.

Ecological Impacts

Under this action, swordfish discarded dead by commercial or recreational fishermen would be counted against the swordfish quota, and thus, would be accounted for in the TAC for the entire stock. Under the expected reduced quotas of a swordfish rebuilding plan, pelagic longline fishermen may reduce the number of sets as a fleet and stop longline fishing when the swordfish season closes. Alternatively, pelagic longline fishermen may continue to fish with longlines, targeting swordfish until that season closes, and then targeting dolphin or tunas with longlines. To a certain extent, NMFS can control incidental catch rates of swordfish by directed fishery gears by adjusting bycatch limits during a closure of the directed fishery. Therefore, NMFS assumes that under a rebuilding plan, future dead discards and landings of swordfish would be proportional to 1997 dead discards/ total catch. Dead discard rates are therefore expected to remain at the 1997 rate (445.7 mt ww of dead discards in comparison to total catch 3421.9 mt ww or 13 percent). If fishermen do not change their fishing patterns (i.e., continue fishing at night), except to discard swordfish after the directed fishery closure, discards may increase. If fishermen exit the fishery to pursue other activities, including other fishing activities, discards may decrease because there will be a shorter directed fishing season. This final action will account for all sources of mortality of the stock, except post-release mortality of fish released alive by both recreational and commercial fishermen, for which NMFS currently has no estimates.

This final action will decrease mortality over time if landings and bycatch are strictly monitored and counted against the quota. This measure may also result in proportional reductions in associated bycatch (since the season will be closed earlier) including sea turtles, marine mammals, and other unmarketable species. It is possible that, when earlier closures occur, effort will be directed to other pelagic longline activities (e.g., the daytime tuna longline fishery), where bycatch levels of unmarketable species may be higher. This measure may encourage fishermen to avoid areas where incidental catch is high but may also encourage inaccurate logbook reporting. This is a difficult impact to address due to relatively low levels of observer coverage. Quotas are monitored in the swordfish fishery based on vessel logbook and dealer reports. NMFS scientists have developed a technique to account for commercial bycatch using logbook and observer data (Cramer and Adams, 1998a). However, this final action may provide an incentive for both recreational and commercial fishermen to underestimate their dead discards of swordfish because they would be penalized with reduced allowable landings for those dead discards.

Both recreational and commercial fishermen have an incentive to handle swordfish in such a manner as to promote their post-release survival, if possible. This is the most conservative alternative for accounting for all sources of mortality on the north Atlantic swordfish stock. NMFS will work with the Advisory Panels, Fishery Management Councils, and the constituency in the future to address all sources of fishing mortality on the north Atlantic swordfish stock, including swordfish taken incidental to other fishing operations.

Social and Economic Impacts

As noted above, NMFS estimates that this final action will result in a 20-percent reduction in the commercial quota as compared with the status quo (assuming1997 discard levels and 1999 quota). The economic analyses presented both in this chapter and in Chapter 7 are based on this assumption; as a result, the present values of gross and net swordfish revenues are 20 percent lower than they would be under the status quo. In addition to reducing overall landings, this final action could also affect the timing of closures of the swordfish fishery. Closure projections would be made based upon available discard information on a monthly basis. During closures of the commercial swordfish fishery, if participants try to avoid swordfish, they may pursue other species such as yellowfin and bigeye tunas, and thus mitigate economic losses resulting from this action. This final action might adversely affect commercial fishermen because the Incidental landings quota category will be closed when the Incidental landings quota is reached.

Conclusion

If successful, this action will result in an ICCAT recommendation to count dead discards against the total U.S. quota. The United States would then be able to implement this action consistent with ATCA. This final action supports the foundation for the development of an international rebuilding program for north Atlantic swordfish at the November 1999 ICCAT meeting. Rebuilding a stock requires accounting for all sources of mortality on that stock. While this action may not be a solution to reducing bycatch mortality, it will support rebuilding by accounting for discard mortality of swordfish. In addition, dead discards of swordfish in the recreational fishery are expected to be minimal, particularly if recreational fishermen are educated about proper handling and release procedures as the stock recovers (see Section 3.5).

Final Action: Subtract recreational landings and discards of north Atlantic swordfish from Incidental Catch Quota

This action will require that all recreational swordfish landings and discards be subtracted from the U.S. Incidental Quota (directed commercial landings and discards are subtracted from the Directed Fishery Quota). In the future, NMFS will undertake allocation discussions with the HMS Advisory Panel and fishery constituents and may consider re-allocation of the U.S. north Atlantic swordfish TAC among all fishery users. As a result of this action, the United States will be required to report recreational swordfish landings and dead discards to ICCAT annually. The Large Pelagic Survey and other data collection methods (charter/headboat logbooks, observer programs, tournament reports) will be used to generate an annual landings and dead discard estimate. This estimate of recreational landings will be subtracted annually from the Incidental swordfish quota.

Because recreational landings are not tabulated until the end of the season, there is a possibility that the current year's Incidental Quota would be filled. Therefore, one year's landings will be subtracted from the following year's quota if the current year's quota is full. The estimate of recreational dead discards will be accounted for; the process of that accounting will be dependent on the recommendation adopted at ICCAT in 1999 (see above discussion of dead discard accounting possibilities). At such time in the future when swordfish rebuild and recreational fishermen begin to direct fishing effort on this species, NMFS intends to make a decision as to how to allocate swordfish TAC to accommodate the directed fishery effort.

Ecological Impacts

By accounting for all sources of mortality on the overfished north Atlantic swordfish stock, SCRS will be able to make more accurate projections of stock size and therefore estimate fishing mortality rates that will support a rebuilding program. NMFS has heard of occasional interactions between recreational fishermen and sea turtles, however, those interaction rates are low and NMFS does not think this alternative would likely have any impact on sea turtles.

Social and Economic Impacts

This alternative might adversely affect commercial fishermen because the Incidental Catch quota category would be closed when the quota is reached. This needs to be considered with respect to the new limited access program which may affect how swordfish are accounted for. For example, in the recent past, NMFS has not closed the Incidental Catch quota. However, if some longline fishermen are given limited access swordfish permits, that quota may be reached. The recreational fishery is not expected to catch many swordfish or to discard many dead swordfish and therefore, the reduction in Incidental Catch quota available to the commercial fishermen would likely not have a significant impact. However, as recreational effort increases as swordfish stocks rebuild, the fraction of swordfish taken by recreational fishermen could increase, therefore reducing the amount of swordfish available to other fisheries that incidentally catch swordfish. NMFS will address the future expected directed fishing effort by recreational fishermen with a new TAC allocation system when the need arises. The framework includes a mechanism to allocate swordfish quota among swordfish fishermen.

Conclusion

Accounting for recreational landings and discards of swordfish is consistent with the need to account for all sources of fishing mortality. As effort increases in the swordfish recreational fishery, consistent with stock rebuilding, accounting for increasing fishing effort in the stock assessment will become increasingly important.

Rejected Options for Swordfish Rebuilding

Rejected Option: Do not count dead discards of swordfish against the U.S. swordfish quota allocation (status quo)

Ecological Impacts

The long-term ecological impact of failing to count dead discards against the quota is the perpetuation of fishing in excess of the recommended swordfish removal levels. Following a stock assessment, SCRS provides ICCAT with a maximum total allowable catch. ICCAT allocates landings quotas based on this level of allowable removal, however, landings quotas do not include consideration of dead discards. Fishing operations discard undersized and damaged fish, and failure to count this source of mortality against the quota masks the true condition of the stock.

Social and Economic Impacts

There are no expected short-term social and economic impacts of the status quo alternative. Long-term social and economic impacts could include continued stock declines leading to reduced gross revenues for fishery participants and increased social and economic instability for the fleet.

Conclusion

This alternative is rejected. The Magnuson-Stevens Act requires the development of rebuilding plans for all species that are considered overfished. All sources of fishing mortality must be accounted for and reductions in landings are to be distributed among all fishermen. North Atlantic swordfish was added to the list of overfished fisheries in 1997.

Rejected Option: Status quo for monitoring recreational mortality

This alternative exempts recreational swordfish mortalities from being counted towards U.S. swordfish quotas. Currently the limited recreational fishery is not specifically monitored for directed or incidental swordfish catch, although the Large Pelagic Survey and MRFSS data indicate occasional swordfish landings by recreational fishermen.

Ecological Impacts

Currently, the status quo is not considered to have significant ecological impacts on the North Atlantic swordfish stock. Swordfish are reportedly caught incidental to other trolling recreational fisheries and catch rates are low due to low directed fishing effort attributed to the overfished status of the stock. The United States does not report this limited recreational mortality to ICCAT. However, as swordfish stocks rebuild, the long-term ecological impacts of not reporting will increase. Recreational fishermen can be expected to begin directed fishing effort on swordfish as the stock rebuilds. The expected increase in directed fishing effort on swordfish by recreational fishermen should be monitored and reported to ICCAT to ensure that all sources of mortality of North Atlantic swordfish are accounted for in the stock assessment. Therefore, this alternative is rejected in this FMP.

This alternative would not likely have an impact on protected species because they are reported as being encountered very rarely by rod and reel fishermen in the Atlantic Ocean. This alternative would not likely have a significant impact on non-target species as any unwanted finfish is likely to be discarded alive by recreational fishermen. NMFS has heard of occasional interactions between recreational fishermen and sea turtles, however, those interaction rates are low and NMFS does not think this alternative would likely have any impact on sea turtles. NMFS, however, cannot estimate post-release mortality for sea turtles or finfish at this time.

Social and Economic Impacts

The status quo does not have any short-term social and economic impacts on recreational fishermen due to low catch rates of swordfish and the fact that there is currently a limited amount of directed fishing (including tournaments) for this species. Therefore, not accounting for swordfish recreational catches would not affect fishermen in the short term. However, in the future, as directed fishing effort increases in response to increased incidental encounters (as a result of rebuilding), fishermen could experience negative social and economic impacts from increased fishing mortality that is not accounted for in the stock assessment, causing the stock to decline. Therefore, rebuilding could be hindered by this future increase in fishing mortality by the recreational fishing sector.

Conclusion

All sources of fishing mortality on the overfished north Atlantic swordfish stock, both directed and incidental, should be accounted for in the stock assessment. In addition, U.S. fishing mortality should reflect the TAC allocated to the United States by ICCAT. As recreational fishing effort increases, consistent with swordfish rebuilding, it will become increasingly important to account for it in the stock assessment.

Rejected Option: Establish a recreational quota for north Atlantic swordfish

This alternative would establish a Recreational Catch Quota (landings plus discards). Unused quota would be transferred to the Incidental Catch Quota by an inseason transfer. Catch estimates (landings plus discards) would be made using the Large Pelagic Survey, the Recreational Billfish Survey, the MRFSS data, and tournament reporting until other monitoring programs could be developed. In the future, NMFS will conduct allocation discussions with fishery constituents based on historical swordfish landings and will consider re-allocating the U.S. north Atlantic swordfish quota among all fishery users.

Many members of the HMS AP supported the proposal to establish a recreational quota based on historical landings. They recommended that this quota could be monitored by a tagging program for every swordfish landed by a recreational fisherman. The framework provisions of the final FMP allow for the development of such a program as a regulatory amendment.

Ecological Impacts

This alternative would not be likely to have any ecological impacts provided the quota is not exceeded. NMFS would make ongoing estimates of current recreational landings and discards based on entries in the Large Pelagic Survey database. NMFS would explore the historical proportion of the catch that recreational swordfish fishermen landed and reallocate a limited quota to the recreational fishery based on that and the current catch rates. This alternative could have positive impacts on the swordfish stock because the directed commercial quotas would be decreased accordingly. There could be a positive impact on the stock because recreational fishing mortality would be accounted for in the stock assessment. It is unknown what proportion of swordfish that are caught recreationally are undersized. Therefore, NMFS cannot evaluate what the impacts would be on small swordfish. It is likely, however, that mortality of undersized swordfish that are caught by rod and reel gear is lower than those small swordfish caught on pelagic longline gear.

In addition, interactions between rod and reel gear and protected species is minimal and therefore, reallocating quota away from the pelagic longline fishery might decrease the impacts to marine mammals and sea turtles in the future.

Social and Economic Impacts

Regarding the re-allocation of the swordfish quota to include a share for recreational fishermen, commercial fishermen may experience a short-term negative impact (subtraction of quota from existing directed or incidental quota) followed by a long-term positive impact relative to other recreational quota alternatives. Setting a recreational quota would set a cap on recreational landings. NMFS has not completed analyses of the historical landings of recreational swordfishermen and so it is impossible to quantify the possible reduction in commercial quota at this time. These impacts will be discussed in any future framework rulemaking to establish a recreational swordfish quota.

Conclusion

This alternative is rejected. The administrative burden of this alternative is very high for the long term given the significant interest many swordfishermen would have in setting recreational quotas and the need to monitor those quotas in real-time, as compared to the final action which requires only that landings are calculated at the end of the season. In addition, NMFS recognizes that current recreational catches are very low and much of the quota allocated based on historical catches would end up being reallocated to the commercial fishery, consistent with ATCA requirements until swordfish stocks rebound.

Rejected Option: Status quo north Atlantic swordfish quotas beyond 1999

This option would continue to maintain landings at the levels adopted by ICCAT through 1999. This alternative is rejected because status quo quotas in the future are not currently estimated to support rebuilding. NMFS seeks to have quotas set as part of a rebuilding program based upon the stock projections of the upcoming 1999 swordfish assessment.

Ecological Impacts

According to the 1996 assessment, the status quo ICCAT quotas beyond 1999 would result in further stock declines. Preliminary SCRS analyses indicated that status quo harvest levels are not sustainable and exceed replacement yield. NMFS emphasizes that this alternative would not rebuild overfished north Atlantic swordfish stocks. Even if future catches stayed at the maximum sustainable yield level, the stock would be expected to decline, given that current stock level is below that needed to sustain the maximum sustainable yield. Status quo quotas through 1999 for the north Atlantic swordfish stock are above the replacement yield estimated in the 1996 assessment (could be as low as 9,400 mt, SCRS, 1996a) and in 1997, reported landings exceeded the TAC by 11 percent (SCRS, 1998a). Under status quo, a large increase in swordfish recruitment is not likely if the spawning stock biomass continues to decline. SCRS emphasized the need for effective conservation and management measures throughout the Atlantic Ocean, not only to conserve the stock but to account for the uncertainty associated with the north/south stock structure assumptions. Quantitative ecological impacts of the status quo depend on the accuracy of the 1996 assessment in light of declining north Atlantic swordfish catches over the period 1996 to 1998. However, it is clear that total swordfish biomass at maximum sustainable yield levels may not be achieved in five or ten years without substantial reductions in catch from status quo levels.

Social and Economic Impacts

The long-term social and economic impacts of maintaining status quo catch levels and failing to rebuild the north Atlantic swordfish stock would be substantial to all sectors of the fishing industry, including the trade sector, although short-term impacts would be minimal. As noted in the community profiles (Chapter 9), the pelagic longline fleet is under considerable strain due to increasingly stringent regulations, market difficulties, and problems in securing trained and stable crew members. Numerous vessels are operating on very thin margins. There are no significant safety implications of this alternative.

Conclusion

NMFS rejects status quo quotas in the future except if the 1999 stock assessment indicates they would support rebuilding of the stock with at least a 50-percent probability of recovery.

Rejected Option: Three-year recovery period

Under this alternative, the Atlantic-wide quota for north Atlantic swordfish would be reduced to zero for three years (assuming all countries would stop catching swordfish).

Ecological Impact

This alternative would provide the fastest possible rebuilding for the north Atlantic swordfish stock. The adjusted projection indicates that three years of zero catch would allow the north Atlantic swordfish stock to rebuild to the level capable of supporting the maximum sustainable yield within three years. Even with no directed fishing, however, swordfish would continue to be captured and killed incidentally in other fisheries, likely lengthening the rebuilding period beyond three years.

Another important ecological effect of this alternative would be the expected shift in fishing effort to other species. Other target species in the pelagic longline fishery are yellowfin and bigeye tuna, large coastal sharks (directed permit needed), dolphinfish, and wahoo. Some vessels that participate in the north Atlantic swordfish fishery also participate in the south Atlantic swordfish fishery at different times of the year. It is likely that this alternative would prompt an increase in fishing pressure on these other target species or on south Atlantic swordfish. Bigeye tuna, large coastal sharks, and south Atlantic swordfish are fully fished or overfished, and the stocks have little or no ability to withstand additional fishing pressure at this time. Positive ecological impacts of this alternative include expected reductions in bycatch of billfish, sea turtles, and bluefin tuna associated with reductions in longline fishing activity, which would only be realized if some fishermen exit the fishery instead of continuing to fish with longlines while discarding swordfish. This alternative, as well as other rebuilding alternatives, assume that fishing pressure will be limited by other nations as well as the United States.

Social and Economic Impacts

This alternative presents the option of rebuilding as quickly as possible by reducing the fishing mortality rate to zero until the stock rebounds. According to stock projections, rebuilding could be accomplished in three years at a fishing mortality rate of zero. However, the gross and net revenue implications for these years are obvious and drastic: a quota of zero would result in zero gross and net revenues related to swordfish for the rebuilding period. Vessels that rely heavily on swordfish revenues would be forced to seek revenues from other species caught on a pelagic longline, in other fisheries, or exit fishing altogether. Fishermen would likely continue pelagic longline fishing, thus prompting the agency to consider the effects of bycatch of swordfish. Fisheries to which displaced swordfish effort could viably be redirected would vary by region and type of gear owned by the boat, but might include: the snapper-grouper fishery and the mackerel, squid and butterfish fishery. From a U.S. national perspective, the present values of swordfish gross and net revenues under this alternative are estimated to be slightly lower than under the six-year rebuilding alternative and higher than the 10-year rebuilding alternative. (Chapter 7).

As noted in the social impact analysis, the pelagic longline fleet is under considerable strain due to increasingly stringent regulations, market difficulties, and problems in securing and retaining trained crew members. Numerous vessels are operating on very thin margins. Measures that further restrict this fishery, through large quota reductions or closures, will affect more than just the marginal vessels.

Conclusion

This alternative is rejected. While this alternative provides for the fastest rebuilding to the biomass level capable of supporting maximum sustainable yield, it has substantial adverse economic and social effects and may increase bycatch of swordfish because all swordfish would have to be released. NS 8 of the Magnuson-Stevens Act guides managers to meet conservation objectives while also minimizing adverse impacts on fishing communities and allowing sustained access by those communities to the fishery, to the extent practicable. Other alternatives for rebuilding the north Atlantic swordfish stock meet the conservation objectives of the Magnuson-Stevens Act and of this FMP with fewer adverse social and economic effects on fishery participants and fishing communities. Finally, the U.S. is more likely to garner support at ICCAT for a less restrictive rebuilding program.

Rejected Option: Six-year recovery period

Under this alternative, the north Atlantic-wide TAC for swordfish would be reduced to 6,000 mt ww per year for six years.

Ecological Impact

The adjusted projection indicates that the stock would rebuild to the maximum sustainable yield level in six years at this catch rate. This alternative represents a decrease from the current Atlantic-wide quota level of 11,000 mt ww per year. Allocation to the United States would be approximately 1,740 mt ww per year, a reduction of 45 percent from the current quota level of 3,190 mt ww per year. As with the three-year program above, this alternative would result in increased fishing pressure on other species in the pelagic longline fishery complex as well as an increase in swordfish bycatch.

Social and Economic Impacts

This alternative is an intermediate alternative between rebuilding as quickly as possible (three years) and rebuilding as slowly as the National Standards allow (ten years). According to 1996 stock projections and adjustments, rebuilding could be accomplished in six years with a total north Atlantic swordfish quota of 6,000 mt ww. The United States is assumed to be allotted 29 percent of this amount (1,740 mt ww) during the rebuilding period. The gross and net revenue impacts for the rebuilding years are large, reflecting a quota cut of approximately 45 percent from 1998 levels. As a result, it is likely that some vessels that rely heavily on swordfish revenues would be forced to seek revenues in other fisheries or to exit fishing altogether. Fisheries to which displaced swordfish effort could viably be redirected would vary by region and type of gear owned by the boat, but might include: increased targeting of BAYS tunas by pelagic longline vessels; participation in the snapper-grouper fishery; and participation in the mackerel, squid and butterfish fisheries. Vessels that had shifted effort away from swordfish could direct it back at that time. From a U.S. national perspective, the present values of swordfish gross and net revenues under this alternative are estimated to be slightly higher than under both the three- and ten-year rebuilding alternatives (Chapter 7).

As noted in the social impact analysis, the pelagic longline fleet is under considerable strain due to increasingly stringent regulations, market difficulties, and problems in securing and retaining trained crew members. Measures that further restrict this fishery, through large quota reductions or closures, however, are likely to affect more than just the marginal vessels. There are no significant safety implications of this alternative.

Conclusion

This alternative is rejected at this time because it does not most effectively meet objectives both to rebuild overfished fisheries and to minimize adverse impacts of conservation and management measures on fishing communities, to the extent practicable. Chapter 7 presents a summary of the present value analysis conducted for the final swordfish rebuilding actions. All of the results presented here incorporate the estimated impacts of a possible negotiated discard reporting alternative (i.e., that dead discards would be counted against the U.S. swordfish quota). As noted above (and in the table), the preferred discard reporting alternative has the effect of reducing swordfish landings by an estimated 20 percent.

3.4.1.2.2 Swordfish Domestic Allocation

The U.S. north Atlantic swordfish quota is divided between a Directed Catch Quota (currently 87 percent) and an Incidental Catch Quota (currently13 percent). The directed quota is divided into two, equal semi-annual seasons. Under limited access, authorized fishing gears will depend on the permit category. Directed swordfish permit holders may use longline, harpoon, rod and reel, bandit gear, and handline[2]. Swordfish landed by these gears when the directed fishery is open will be subtracted from the directed fishery quota. Incidental swordfish permit holders may land swordfish taken with squid trawl, rod and reel, handline, or longline gear. Swordfish landed by Incidental swordfish permit holders and by directed permit holders during a directed fishery closure (except harpoon) will be subtracted from the Incidental Catch quota. Handgear permit holders may fish for swordfish with handline, rod and reel, bandit gear, and harpoon. Swordfish landed by these permit holders will be subtracted from the directed fishery when that fishery is open and from the Incidental fishery when the directed fishery is closed. An exception to this is harpoon-landed fish which may not be landed during a directed fishery closure by a permit holder of any type.

[2] Driftnets are no longer authorized in the swordfish fishery and swordfish may not be possessed on board a vessel that has a driftnet on board.

Recreational fishermen are not required to obtain a permit, and may not sell swordfish. NMFS received public comments that supported establishing a separate recreational catch quota that would accommodate the relatively high historical recreational landings. Recreational swordfish landings will be subtracted from the Incidental Catch quota. In the future, NMFS may assemble historical recreational landings data and conduct an allocation discussion among fishery users.

3.4.1.3 Atlantic Sharks

In 1997, NMFS reduced the large coastal shark (LCS) commercial quota and recreational retention limit as an interim measure to increase the probability that no further stock declines would occur until a long-term rebuilding program could be developed. The probability associated with recovery to maximum sustainable yield under that quota and retention limit reduction was 50 percent. This level of certainty was acceptable for an interim measure, especially given the impacts of such a quota reduction on fishermen and their communities. However, 50-percent probability is minimally acceptable for ensuring that overfished fisheries are rebuilt to maximum sustainable yield levels. In developing the rebuilding program for large coastal sharks, NMFS has used a higher threshold of probability *as a guide* in order to ensure that the intended results of a management action are actually realized. Specifically, 70 percent probability frequently appears in the model projections and NMFS has used this higher probability *as a guide* in assessing the relative merits of one rebuilding time frame over another. Many factors are relevant when assessing rebuilding programs, including variability of fish biology, environment, and fishery characteristics. NMFS also used a low probability of a negative outcome as an additional guide in evaluating potential management measures (e.g., less than a 20-percent probability that stock sizes would decrease under a given management measure).

The 1998 SEW Final Report indicates that large coastal sharks remain overfished and would not rebuild at current harvest levels. As an aggregate, a zero landings policy for 30 years (the longest projection considered) does not even meet the minimal probability standard of 50 percent of rebuilding (Table 3.10). After 30 years at zero landings, the LCS baseline catch series projection indicates a 46-percent probability of reaching maximum sustainable yield levels whereas the alternative catch series projection indicates a 39-percent probability of almost reaching maximum sustainable yield (Table 3.11). Given these results, commercial and recreational directed fisheries would be need to be eliminated for at least 30 years as bycatch mortality alone may jeopardize rebuilding if LCS continue to be managed as an aggregate. Additionally, bycatch mortality in incidental fisheries would need to be reduced to the maximum extent possible in order to increase the probability of recovery of the LCS complex within 30 to 40 years.

Regarding the 1997 quotas relative to the 1995 quota levels, LCS as an aggregate were reduced by 37 percent (in numbers of fish) when considering commercial and recreational landings combined (Table 3.12). When considering commercial landings alone, the landings of LCS were reduced by 56 percent in numbers of fish (six percent more than the target reduction) or by 56 percent by weight (six percent more than the target reduction, Table 3.12; see Table 2, Scott *et al.*, 1996). Recreational harvest of large coastal sharks was reduced by 12 percent (in numbers of fish), or 38 percent less than the target reduction (Table 3.12). Relative to the levels of landings necessary to rebuild under the selected rebuilding program, landings of large coastal sharks as an aggregate would need to be reduced to zero for at least 30 years.

Due to the severity of the reductions that would be required in LCS landings in order to rebuild LCS as an aggregate consistent with the Magnuson-Stevens Act and the NSGs, NMFS developed separate rebuilding schedules for species complexes based on sandbar sharks (ridgeback LCS) and blacktip sharks (non-ridgeback LCS) utilizing new information contained in the 1998 SEW Final Report.

Table 3.10 The projections from the 1998 SEW for large coastal sharks with a 10-, 20-, and 30-year time horizon under several alternative quota policies relative to the 1995 quota. Fifty percent of 1995 levels is status quo. Nfin/K is the ratio of stock size at the end of the projection to carrying capacity (K). Also shown is the probability that stock size will be less than 20% of K (Nfin<0.2K), more than 50% of K (Nfin>0.5K), and higher than the 1998 stock size (Nfin>N98). (NMFS, 1998a)

A) Large Coastal Shark Baseline Catch Series

Horizon	f=%C95	Nfin/K	P(Nfin<0.2K)	P(Nfin>0.5K)	P(Nfin>N98)
10-year	0	0.23	0.42	0.00	1.00
	10	0.18	0.68	0.00	0.66
	20	0.12	0.88	0.00	0.21
	30	0.07	0.97	0.00	0.03
	40	0.03	1.00	0.00	0.00
	50	0.01	1.00	0.00	0.00
20-year	0	0.36	0.14	0.20	1.00
	10	0.25	0.46	0.07	0.74
	20	0.11	0.82	0.02	0.24
	30	0.03	0.97	0.00	0.04
	40	0.01	1.00	0.00	0.00
	50	0.01	1.00	0.00	0.00
30-year	0	0.50	0.04	0.46	1.00
	10	0.33	0.37	0.23	0.76
	20	0.12	0.78	0.07	0.24
	30	0.03	0.96	0.01	0.04
	40	0.01	1.00	0.00	0.00
	50	0.01	1.00	0.00	0.00

Table 3.10 (continued)

B) Large Coastal Shark Alternative Catch Series

Horizon	f=%C95	Nfin/K	P(Nfin<0.2K)	P(Nfin>0.5K)	P(Nfin>N98)
10-year	0	0.25	0.26	0.01	1.00
	10	0.22	0.49	0.00	0.76
	20	0.17	0.71	0.00	0.30
	30	0.13	0.86	0.00	0.10
	40	0.09	0.95	0.00	0.04
	50	0.07	0.98	0.00	0.03
20-year	0	0.36	0.07	0.15	1.00
	10	0.27	0.33	0.08	0.82
	20	0.18	0.67	0.02	0.35
	30	0.10	0.86	0.01	0.15
	40	0.09	0.90	0.00	0.13
	50	0.09	0.89	0.01	0.12
30-year	0	0.47	0.03	0.39	1.00
	10	0.34	0.25	0.19	0.84
	20	0.18	0.65	0.08	0.36
	30	0.11	0.80	0.03	0.21
	40	0.15	0.72	0.03	0.33
	50	0.29	0.31	0.06	0.75

Table 3.11 Large coastal shark rebuilding decision analysis.

Analysis	Quota Level (% 1995 Quota)	Horizon (years)	Probability of Rebuilding	Able to Rebuild Within 10 years?	Rebuilding Schedule
Baseline	0	30	0.46	No	not developed (see below)
Alternative	0	30	0.39	No	

Table 3.12 Large coastal shark landings analysis.

	1995 Landings (#s of fish)	1997 Landings (#s of fish)	Percent Reduction of 1997 landings from 1995 landings. Target was 50% reduction.	Landings under Rebuilding (#s of fish)
Recreational	183,400	161,900	12%	Bycatch only (see below)
Commercial	222,400	98,400	56%	
Adjusted Commercial (weight)	7,211,688 (pounds)	3,127,223 (pounds)	56%	
Total	**405,800**	**260,300**	**37%**	

Sandbar sharks

The production modeling results and projections for sandbar sharks are considerably more optimistic than those for LCS; however, the probability that sandbar sharks could rebuild within ten years is low. Considering the baseline catch series, the probability that sandbar sharks could rebuild within ten years under zero landings is 41 percent, which is less than the acceptable minimum probability (Table 3.13). Considering the alternative catch series, the probability that sandbar sharks could rebuild within ten years increases to 70 percent under a zero landing policy and is approximately 50 percent under the status quo (Table 3.13). This is greater than the acceptable minimum probability. However, the 1998 SEW Final Report states "[r]ecovery to maximum sustainable yield is likely to be a lengthy process under the best of circumstances, and it is unlikely that full recovery of the resource to maximum sustainable yield stock level could occur within a decade under any catch scenario" (p. 30).

In developing a rebuilding program and time frame for sandbar sharks, it is important to note that several other species (e.g., dusky sharks, bignose sharks) are easily misidentified as sandbar sharks and any management measure based on sandbar sharks would necessarily include some mortality on those other species. Additionally, the dusky shark, which ranks as the second-most important sandbar-like species in commercial and recreational landings data, is considerably less productive than the sandbar shark. For example, dusky sharks are slower to mature (235 cm FL for dusky sharks vs. 150 cm FL for sandbar sharks), has a longer gestation period (16 months vs. about 12 months), and may have a three year reproductive cycle rather than a two year reproductive cycle. Estimates of mean generation lengths for dusky sharks average 27.5 years whereas the sandbar shark estimates average 19 years (see Cortes and Scott, 1998). Thus, considering the life histories of species like dusky sharks becomes particularly relevant in assessing realistic rebuilding programs based primarily on sandbar sharks. The implication for a sandbar-based rebuilding program is that the other species in the complex may limit the ability of the complex to rebuild within a time frame that a sandbar-only fishery could rebuild.

NMFS believes that a sandbar-based complex, which would include mortality on other species like the less productive dusky shark, would not realistically be able to reach maximum sustainable yield levels within ten years even under a zero landings policy. Accordingly, NMFS believes that "zero plus one mean generation time frame" is the appropriate rebuilding time frame for a sandbar-based complex. Based on the projections for the baseline sandbar shark catch series from the 1998 SEW, sandbar sharks would have a 71-percent probability of reaching maximum sustainable yield levels under a zero landings policy for about 20 years. Thus, when considering the sandbar mean generation time of 19 years, an appropriate and realistic time frame for rebuilding a sandbar-based complex would be about 39 years (Table 3.14). Note that the rebuilding time frame would be approximately 47.5 years if the dusky shark mean generation time had been selected, and that using the sandbar shark mean generation time results in a more conservative (i.e., shorter) time frame within which management measures must be developed and implemented.

Thus, within a 39-year rebuilding time frame, the baseline projections indicate that sandbar sharks would have a 51-percent probability of reaching maximum sustainable yield levels within 30 years under a 30 percent of 1995 quota policy (Table 3.13). While this probability is only the minimal acceptable, NMFS believes that the weight of evidence from the catch rate indices (four of five indices exhibit positive slopes; the only negative slope was not statistically significant, see Chapter 2) and the alternative catch analyses (sandbar sharks could rebuild under status quo quota levels) supports a less restrictive approach. Additionally, given the fact that the rebuilding time frame exceeds the longest projection available, NMFS believes that a lower probability for a shorter time frame adequately approximates the level of certainty required for a longer time frame. Additionally, there is a low probability that the stock size would continue to decrease (20 percent and seven percent under the baseline and alternative catch series scenarios, respectively) and a high probability that the stock size in 30 years will increase (73 percent and 91 percent under the baseline and alternative catch series scenarios, respectively; Table 3.13).

Table 3.13 The projections from the 1998 SEW for sandbar sharks with a 10-, 20-, and 30-year time horizon under several alternative quota policies relative to the 1995 quota. Fifty percent of 1995 levels is status quo. Nfin/K is the ratio of stock size at the end of the projection to carrying capacity (K). Also shown is the probability that stock size will be less than 20% of K (Nfin<0.2K), more than 50% of K (Nfin>0.5K), and higher than the 1998 stock size (Nfin>N98). (NMFS, 1998a)

C) Sandbar Baseline Catch Series

Horizon	f=%C95	Nfin/K	P(Nfin<0.2K)	P(Nfin>0.5K)	P(Nfin>N98)
10-year	0	0.48	0.05	0.41	1
	10	0.45	0.09	0.36	0.98
	20	0.41	0.14	0.31	0.88
	30	0.38	0.19	0.26	0.70
	40	0.34	0.27	0.22	0.54
	50	0.30	0.36	0.17	0.41
20-year	0	0.64	0.02	0.71	1
	10	0.59	0.05	0.61	0.98
	20	0.52	0.11	0.52	0.89
	30	0.45	0.20	0.42	0.72
	40	0.38	0.32	0.33	0.55
	50	0.31	0.45	0.26	0.41
30-year	0	0.75	0.00	0.85	1
	10	0.68	0.03	0.75	0.99
	20	0.60	0.09	0.64	0.90
	30	0.50	0.20	0.51	0.73
	40	0.40	0.35	0.40	0.55
	50	0.31	0.49	0.31	0.41

Table 3.13 (continued)

D) Sandbar Alternative Catch Series

Horizon	f=%C95	Nfin/K	P(Nfin<0.2K)	P(Nfin>0.5K)	P(Nfin>N98)
10-year	0	0.66	0.02	0.70	1
	10	0.64	0.03	0.67	1
	20	0.61	0.05	0.64	0.97
	30	0.58	0.08	0.59	0.9
	40	0.55	0.12	0.53	0.82
	50	0.52	0.16	0.50	0.74
20-year	0	0.80	0.01	0.86	1
	10	0.77	0.01	0.82	1.00
	20	0.72	0.04	0.76	0.97
	30	0.68	0.07	0.72	0.91
	40	0.63	0.13	0.68	0.83
	50	0.58	0.18	0.61	0.74
30-year	0	0.87	0.00	0.94	1
	10	0.83	0.01	0.89	1.00
	20	0.78	0.03	0.84	0.98
	30	0.73	0.07	0.79	0.91
	40	0.67	0.14	0.72	0.83
	50	0.60	0.21	0.67	0.74

Table 3.14 Sandbar-based complex rebuilding decision analysis.

Analysis	Quota Level (% 1995 Quota)	Horizon (years)	Probability of Rebuilding	Able to Rebuild Within 10 years?	Rebuilding Schedule
Baseline	0	10	0.41	No, therefore select "Zero Fishing Plus One Mean Generation Time"	30% of 1995 quota for 39 years (20 + 19 years)
	0	20	0.71		
Alternative	0	10	0.7	Yes, at zero landings	see above, baseline catch series analysis
	50 (status quo)	20	0.5	Yes, with minimal probability	

Table 3.15 Sandbar shark landings analysis.

	1995 Landings (#s of fish)	1997 Landings (#s of fish)	Percent Reduction of 1997 landings from 1995 landings. Target was 50% reduction.	Landings under Rebuilding (#s of fish)	Additional Reduction Needed to Rebuild
Recreational	24,869	40,929	-64%	7,461	82%
Commercial	82,749	31,990	61%	24,824	22%
Adjusted Commercial (weight)	3,012,065 (pounds)	982,100 (pounds)	67%	903,616 (pounds)	8%
Total	**107,618**	**72,919**	**32%**	**32,286**	**56%**

Regarding the 1997 landing reductions relative to the 1995 quota levels, sandbar sharks were reduced by 32 percent (in numbers of fish) when considering commercial and recreational landings combined (Table 3.15). When considering commercial landings alone, the landings of sandbar sharks was reduced by 61 percent in numbers of fish (11 percent more than the target reduction) or by 67 percent by weight (17 percent more than the target reduction using the sandbar-specific catch series). Recreational harvest of sandbar sharks increased by 64 percent (in numbers of fish). Relative to the levels of landings necessary to rebuild under the 30 percent of 1995 quota policy, landings of sandbar sharks need to be further reduced by 56 percent for commercial and recreational landings combined, by 22 percent for commercial landings in numbers of fish or by eight percent by weight, and by 82 percent for recreational harvest (Table 3.15).

Blacktip sharks

The modeling results and projections for blacktips more closely follow those for the LCS aggregate than those for sandbar sharks alone. As with the aggregated LCS, blacktip sharks have less than a minimally acceptable probability of rebuilding to maximum sustainable yield levels within ten years even under a zero landings policy. Blacktip sharks would have only a 36-percent and 27-percent probability of rebuilding within ten years at zero landings under the baseline and alternative catch series analyses, respectively (Table 3.16). Accordingly, NMFS believes that "zero plus one mean generation time frame" is the appropriate rebuilding time frame for a blacktip-based complex. Based on the projections for the baseline blacktip shark catch series from the 1998 SEW, blacktip sharks would have a 69-percent probability of reaching maximum sustainable yield levels under a zero landings policy for about 20 years (Table 3.16). Thus, when considering the blacktip mean generation time of 9.4 years (see Cortes and Scott, 1998), an appropriate and realistic time frame for rebuilding a blacktip-based complex would be 29.4 years, or approximately 30 years (Table 3.17).

As with sandbar sharks, it is important to note that management measures would essentially target a blacktip-based complex and that other species within that complex need to be considered in developing a blacktip-based rebuilding program. However, unlike the sandbar-based complex in which the secondary species of importance in harvest data is considerably less productive than primary species, the blacktip-based complex is more homogenous in terms of relative productivity. Therefore, a blacktip-based rebuilding program is more likely to characterize the species in a blacktip-based complex.

Thus, within a 30-year rebuilding time frame, the baseline projections indicate that blacktip sharks would have a 54-percent probability of reaching maximum sustainable yield levels within 30 years under a 20 percent of 1995 quota policy. The baseline projections indicate that blacktip sharks would have a 71-percent probability of reaching maximum sustainable yield levels within 30 years under a ten-percent of 1995 quota policy (Table 3.16). While the probability of reaching maximum sustainable yield under a 20-percent of 1995 quota policy does not meet the goal of 70-percent probability, NMFS believes that several factors preclude a high level of certainty. In particular, the level of uncertainty regarding catch rates, and species and size composition of sharks landings in the western Gulf of Mexico and the statement in 1998 SEW Report that "[f]or blacktips, large reductions in catches may be needed, but it is unclear whether reductions in the United States alone would achieve the intended goals" indicate that some latitude may be necessary until such issues are addressed. Accordingly, NMFS believes that a 20-percent of 1995 quota policy for 30 years is a reasonable rebuilding time frame for a blacktip-based complex (Table 3.17). Furthermore, there is a low probability that the stock size would continue to decrease (21 percent and 20 percent under the baseline and alternative catch series scenarios, respectively) and a high probability that the stock size in 30 years will increase (75 percent and 77 percent under the baseline and alternative catch series scenarios, respectively), under these quota levels (Table 3.16).

Regarding the 1997 landing reductions relative to the 1995 landing levels, blacktip sharks were reduced by 30 percent (in numbers of fish) when considering commercial and recreational landings combined (Table 3.18). When considering commercial landings alone, the landings of blacktip sharks were reduced by 46 percent in numbers of fish (four percent less than the target reduction) or by 41 percent by weight (nine percent less than the target reduction using the blacktip-specific catch series). Recreational harvest of blacktip sharks increased by two percent (in numbers of fish). Relative to the levels of landings necessary to rebuild under the 20 percent of 1995 quota policy, landings of blacktip sharks need to be further reduced by 71 percent for commercial and recreational landings combined, by 63 percent for commercial landings in numbers of fish or by 66 percent by weight, and by 81 percent for recreational harvest (Table 3.18).

Table 3.16 The projections from the 1998 SEW for blacktip sharks with a 10-, 20-, and 30-year time horizon under several alternative quota policies relative to the 1995 quota. Fifty percent of 1995 levels is status quo. Nfin/K is the ratio of stock size at the end of the projection to carrying capacity (K). Also shown is the probability that stock size will be less than 20% of K (Nfin<0.2K), more than 50% of K (Nfin>0.5K), and higher than the 1998 stock size (Nfin>N98). (NMFS, 1998a)

E) Blacktip Baseline Catch Series

Horizon	f=%C95	Nfin/K	P(Nfin<0.2K)	P(Nfin>0.5K)	P(Nfin>N98)
10-year	0	0.45	0.08	0.36	1
	10	0.41	0.15	0.29	0.94
	20	0.35	0.26	0.21	0.71
	30	0.28	0.39	0.12	0.48
	40	0.22	0.53	0.09	0.29
	50	0.17	0.65	0.06	0.16
20-year	0	0.64	0.02	0.69	1
	10	0.56	0.09	0.56	0.96
	20	0.45	0.22	0.42	0.75
	30	0.34	0.40	0.30	0.51
	40	0.22	0.59	0.17	0.31
	50	0.14	0.74	0.10	0.16
30-year	0	0.77	0.01	0.86	1
	10	0.66	0.06	0.71	0.96
	20	0.52	0.21	0.54	0.75
	30	0.37	0.42	0.38	0.52
	40	0.23	0.62	0.22	0.31
	50	0.13	0.79	0.13	0.17

F) Blacktip Alternative Catch Series

Horizon	f=%C95	Nfin/K	P(Nfin<0.2K)	P(Nfin>0.5K)	P(Nfin>N98)
10-year	0	0.41	0.10	0.27	1
	10	0.38	0.18	0.24	0.95
	20	0.33	0.29	0.17	0.73
	30	0.27	0.41	0.13	0.52
	40	0.22	0.53	0.06	0.33
	50	0.16	0.63	0.04	0.21
20-year	0	0.61	0.02	0.62	1
	10	0.53	0.09	0.51	0.97
	20	0.44	0.23	0.38	0.76
	30	0.34	0.39	0.28	0.54
	40	0.24	0.56	0.19	0.34
	50	0.17	0.70	0.14	0.23
30-year	0	0.73	0.00	0.79	1
	10	0.64	0.06	0.67	0.97
	20	0.52	0.20	0.52	0.77
	30	0.38	0.39	0.37	0.55
	40	0.26	0.62	0.26	0.35

Horizon	f=%C95	Nfin/K	P(Nfin<0.2K)	P(Nfin>0.5K)	P(Nfin>N98)
	50	0.17	0.75	0.17	0.23

Table 3.17 Blacktip-based complex rebuilding decision analysis.

Analysis	Quota Level (% 1995 Quota)	Horizon (years)	Probability of Rebuilding	Able to Rebuild Within 10 years?	Rebuilding Schedule
Baseline	0	10	0	No, therefore select "Zero Fishing Plus One Mean Generation Time"	20% of 1995 quota for 30 years (20 + 9 years)
	0	20	1		
Alternative	0	10	0	No	see above, baseline catch series analysis
	0	20-30	1	Yes, at zero landings	

Table 3.18 Blacktip shark landings analysis.

	1995 Landings (#s of fish)	1997 Landings (#s of fish)	Percent Reduction of 1997 landings from 1995 landings. Target was 50% reduction.	Landings under Rebuilding (#s of fish)	Additional Reduction Needed to Rebuild
Recreational	67,046	68,284	-2%	13,409	81%
Commercial	139,512	75,650	46%	27,903	63%
Adjusted Commercial (weight)	2,915,797 (pounds)	1,709,694 (pounds)	41%	583,160 (pounds)	66%
Total	**206,558**	**143,934**	**30%**	**41,312**	**71%**

3.4.1.3.1 Commercial Quota Alternatives for Large Coastal Sharks

The ramifications of further quota reductions for the directed commercial LCS fishery are substantial. Evidence available to NMFS indicates that some directed LCS fishermen have already left the fishery as it is no longer economically viable for them to continue fishing under the reduced LCS quota. It is reasonable to assume, given the magnitude of the additional reductions in the commercial quota that are necessary to reduce fishing mortality to rebuild LCS and to account for all sources of fishing mortality (dead discards and state landings after Federal closures), that the directed fishery may essentially be eliminated. Landings of LCS in incidental commercial fisheries may continue to occur unless regulations limiting effort in those other fisheries are implemented. A reduced commercial quota could result in increased discards of LCS due to prolonged directed fishery closures, if they continue to operate unchanged, contrary to the desired reduction in effective fishing mortality. This increase in discards may substantially offset the expected reductions in effective fishing mortality under the selected rebuilding program.

NOTE: The final action to implement a public display and scientific research quota of 60 mt ww, or 43 mt dw, is not explicitly discussed below but are reflected in the final quota levels for LCS. The final action for the public display and scientific research quota is discussed in Section 3.4.1.3.6.

Final Action: Separate LCS management group into ridgeback and non-ridgeback LCS with each subgroup having separate quotas; Establish a minimum size and maintain quota level of 620 mt dw on ridgeback LCS; Reduce the quota on non-ridgeback LCS to 196 mt dw

This action subdivides the LCS management group into a ridgeback LCS subgroup and a non-ridgeback LCS subgroup. A number of shark species in the LCS management group are characterized by a mid-dorsal ridge that is easily identified even after the fish has been headed, gutted, and finned. Thus, the mid-dorsal ridge is useful as a diagnostic characteristic for management and enforcement purposes. This action also splits the LCS aggregate quota into separate ridgeback LCS and non-ridgeback LCS quotas, based on historical landings, and establishes a minimum size restriction for ridgeback LCS. Because the minimum size is expected to reduce effective fishing mortality by the amount necessary to rebuild this subgroup, this action does not reduce the quota for ridgeback LCS, except for half of the public display quota (maintain quota at 642 mt dw per year minus 30 mt ww (22 mt dw) public display quota). The quota for non-ridgeback LCS will be reduced to 196 mt dw per year (218 mt dw minus 30 mt ww (22 mt dw) public display quota). All ridgeback LCS below the minimum size must be released in a manner that will ensure the maximum probability of survival.

The "ridgeback" sharks within the LCS unit authorized for retention include sandbar, silky, and tiger sharks (dusky, night, bignose, Caribbean reef, and Galapagos sharks also have a "ridge"; however, these species are classified as prohibited species under the final action in Section 3.4.2.3.1). Additionally, sandbar and dusky sharks, the two primary species within this subgroup that are targeted by commercial and recreational fisheries, have similar life history traits, geographic ranges, and appearances so they are often confused. The term "sandbar-dusky complex" is often used to describe the dominant species in these fisheries.

The "non-ridgeback" sharks within the LCS unit authorized for retention include the blacktip, spinner, bull, nurse, lemon, great hammerhead, scalloped hammerhead, and smooth hammerhead sharks (narrowtooth sharks also lack a "ridge"; however, this species is classified as prohibited under the final action in Section 3.4.2.3.1). The primary species within this subgroup are the blacktip shark, followed by the aggregate hammerheads and bull sharks. The species that would comprise the non-ridgeback subgroup also have similar life history traits and geographic ranges, and the term "blacktip-spinner complex" is often used to describe the dominant species in these fisheries.

The safety at sea concerns resulting from a ridgeback LCS minimum size that would push fishing effort offshore are considerable for the North Carolina winter fishery. However, the area off Cape Hatteras is considered an important over-wintering area for juvenile and subadult sandbar and dusky sharks. One potential alternative to a minimum size for ridgeback LCS that would address safety at sea concerns and meet rebuilding objectives would be a time/area closure for directed ridgeback LCS fishing off Cape Hatteras in winter months (see Section 3.5.2.3 for a discussion of this issue).

Ecological Impacts

This action is a step towards species-specific management and responds to the 1998 SEW recommendation that "[e]very effort should be made to manage species separately" and to NMFS's goal of minimizing economic impacts on fishermen and communities, to the extent practicable. While this action would not manage on an actual species level, the identification and enforcement problems with species-specific management measures are insurmountable at this time. This action allows for management measures to be more tailored to those species complexes within the larger LCS unit with which different fisheries interact. For example, the sandbar-dusky fishery operates primarily in the southeast Atlantic region from North Carolina south to Florida. On the other hand, the blacktip-spinner fishery is a more southern fishery from Florida through the Gulf of Mexico.

This action, by establishing separate quota levels for the ridgeback (sandbar based) and non-ridgeback (blacktip based) LCS, will allow for greater quota levels on those species complexes that can withstand higher fishing mortality while still restricting fishing mortality on those species complexes that cannot. In this way, ridgeback and non-ridgeback LCS rebuilding programs can minimize adverse economic impacts while achieving conservation objectives.

Table 3.19 Average percentage of landings of ridgeback species versus non-ridgeback LCS species. Does not include the weight of prohibited species and fins. (Poffenberger, 1996, Scott *et al.*, 1998)

	Ridgeback LCS commercial landings (pounds dw)	**Non-Ridgeback LCS commercial landings (pounds dw)**
1994	1,341,692	891,258
1995	2,106,501	891,537
1996	2,107,478	2,049,405
1997	961,793	1,642,056
Total	**6,427,464**	**5,474,256**
Average landings per year	1,606,866	1,368,564
Percent of total landings	54%	46%

Adjusted commercial landings data during the period 1994 through 1997 (based on the species-specific catch histories in the 1998 SEW Final Report; Table 3.19) show that commercial landings of those species in the ridgeback and non-ridgeback LCS subgroups are roughly equivalent. Therefore, under this action, separate quotas of 620 mt dw (based on half of the 1997 LCS commercial quota (642 mt dw) minus half of the public display quota (22 mt dw)) would be established as the reference point for the ridgeback and non-ridgeback subgroups. To determine the level of landings by subgroup that is consistent with the selected rebuilding program (see above), the sandbar-based ridgeback LCS commercial quota would need to be reduced by 22 percent by number and by eight percent by weight, and the blacktip-based non-ridgeback LCS commercial quota would need to be reduced by 63 percent by number and 66 percent by weight, relative to 1997 landings levels (Tables 3.15 and 3.18).

The rationale for establishing a minimum size for ridgeback LCS is that several demographic analyses for sandbar sharks indicate that juvenile and subadult stages or sizes are the most sensitive to fishing mortality (Sminkey and Musick, 1995, Brewster-Geisz and Miller, 1998, Cortes and Scott, 1998) and that protection of these sensitive stages can greatly enhance recovery to maximum sustainable yield levels. Furthermore, the sensitivity that these subadult stages/sizes exhibit declines considerably right before the sharks reach full maturity. These results support a minimum size at first maturity (the first recorded size at maturity) that would effectively protect the most sensitive stages/sizes.

While these results are perhaps more relevant for the non-ridgeback LCS (due to the greater reductions in fishing mortality needed), a minimum size restriction is implemented only for ridgeback LCS because of the distinct size-depth segregations exhibited by sandbar and dusky sharks, as evidenced by observer data (see below). This size-depth segregation results in smaller juvenile and subadult sandbar and dusky sharks predominating in nearshore waters (less than ten fathoms) and larger adults predominating in offshore waters (greater than ten fathoms; Branstetter and Burgess, 1998 a,b). Therefore, it is possible to target fishing effort on the less sensitive adult sandbar and dusky sharks by concentrating fishing effort in offshore areas. The 1998 SEW Final Report states "[t]he size-depth segregation of sandbar sharks is likely to result in less bycatch of smaller, immature individuals, thereby reducing effective fishing mortality" (p.34).

Additionally, observer data indicate that a moderate to high percentage of sandbar sharks are brought to the vessel alive in the directed commercial bottom longline fishery (Branstetter and Burgess, 1998a). For example, approximately 43 to 86 percent of sandbar sharks are brought to the vessel alive, depending on the region and time of year; conversely, 14 to 57 percent of sandbar sharks are brought to the vessel dead (see Table 9, Branstetter and Burgess, 1998a). Observer data for dusky sharks indicate that this species suffers higher fishing-related mortality than sandbar sharks (approximately 21 to 50 percent of dusky sharks are brought to the vessel alive; conversely, about 50 to 79 percent of dusky sharks come to the vessel dead).

However, a minimum size for ridgeback LCS, by pushing fishing effort offshore out of areas where small sandbar and dusky sharks predominate, will still reduce fishing mortality on the sensitive smaller fish and enhance dusky shark rebuilding.

This action does not implement a minimum size on non-ridgeback LCS due to concerns that such a measure might actually increase fishing mortality on blacktip sharks (the primary non-ridgeback LCS). Observer data indicate that the juvenile, subadult, and adult blacktip sharks occur in mixed schools in nearshore areas. Therefore, it is not possible to target the larger blacktip adults without frequently encountering the juveniles and subadults. The 1998 SEW Final Report states "[a]s it may be difficult to target a stage/size class of blacktip sharks and thereby redistribute fishing mortality onto older, less sensitive stages/sizes, a commercial minimum size on blacktip sharks may actually increase effective fishing mortality as more small fish are caught and discarded in order to harvest the same quantity of larger fish" (p. 34). The argument against a minimum size for blacktip sharks, and therefore non-ridgeback LCS, is further supported by the low survival of blacktip sharks in the directed commercial bottom longline fishery. Observer data indicate that approximately six to 34 percent of blacktip/spinner sharks are brought to the vessel alive, depending on the region and time of year; conversely, 66 to 94 percent of blacktip/spinner sharks are brought to the vessel dead (Branstetter and Burgess, 1998a).

Relative to the rebuilding program, a minimum size on ridgeback LCS (unlike the non-ridgeback LCS) will allow a higher level of effective fishing mortality while still achieving positive growth to maximum sustainable yield levels, although what that level of fishing mortality would be is unknown at this time. As discussed above, a minimum size that approximates the size at first maturity will effectively protect the most sensitive stages/sizes. For sandbar sharks, the primary ridgeback LCS, this size equates to approximately 137 to 140 cm FL, or 4.5 feet FL. A minimum size that would approximate dusky shark age at first maturity would be approximately 235 cm FL, or about 7.5 feet FL. Regardless of whether a minimum size was based on sandbar or dusky sharks, the ancillary protection for the other species by concentrating fishing effort offshore should be substantial (see Figure 3.3).

Establishing a sandbar-based minimum size of 137-cm FL for ridgeback LCS in the commercial fishery will have differential ecological impacts by region and time of year. Based on observer data, reductions in sandbar and dusky shark landings may range from four to 70 percent and nine to 65 percent, respectively, depending on region and fishing season. For example, sandbar sharks below a 137-cm FL minimum size in the winter season approximate 22, five, and 76 percent in the Florida east coast, Florida gulf coast, and North Carolina regions, respectively, whereas in the summer season, sandbar sharks below a 137-cm FL minimum size comprise eight, seven, and 35 percent in Florida east coast, Florida gulf coast, and North Carolina regions, respectively (Table 3.20). Overall reductions would approximate 19, five, and 70 percent for both seasons combined in the Florida east coast, Florida gulf coast, and North Carolina regions, respectively, and approximately 51 percent for both seasons and all regions combined. The ecological benefits of a sandbar-based minimum size for ridgeback LCS will be substantial in the North Carolina region, and particularly in the winter season, as this fishery has increasingly targeted juvenile and subadult sandbar and dusky sharks over the past few years. Thus, a minimum size of 137-cm FL will greatly reduce effective fishing mortality on juveniles and subadults in this important wintering area.

Figure 3.3 LCS size distribution in fork length (cm) from commercial fisheries 1994-1996. N = 11803, Mean = 132.3, Std. Mean Error = 0.32. (G. Scott, NMFS-SEFSC, Miami, FL, 1998)

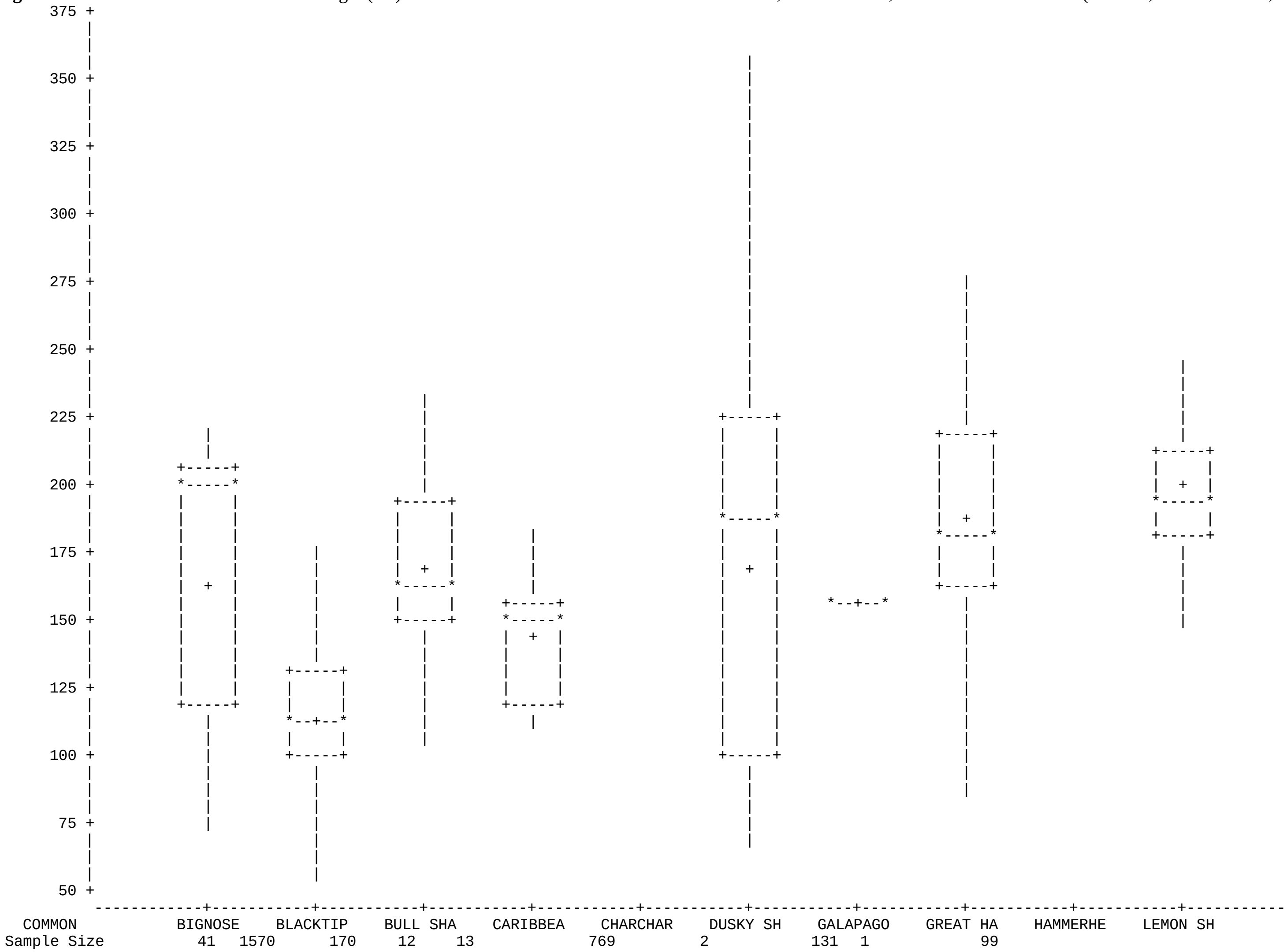
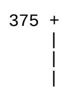


Figure 3.3 (continued)



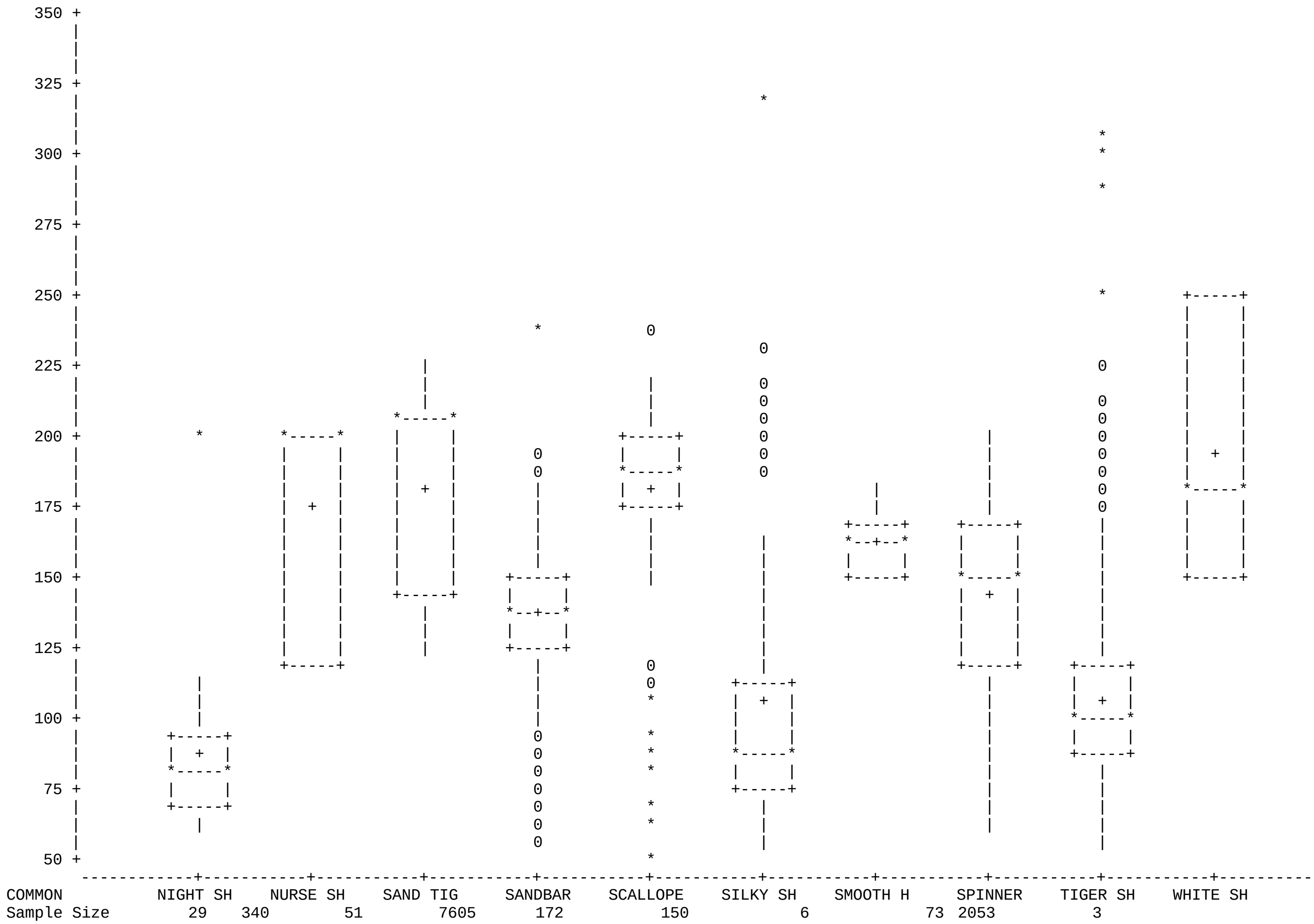

350
325
300
275
250
225
200
175
150
125
100
75
50
COMMON NIGHT SH NURSE SH SAND TIG SANDBAR SCALLOPE SILKY SH SMOOTH H SPINNER TIGER SH WHITE SH
Sample Size 29 340 51 7605 172 150 6 73 2053 3

Table 3.20 Size distribution of some commercially important sharks by season and region. Note: this table includes only those fish that were measured. (Branstetter and Burgess, observer data, 1997)

Species	Region	Winter			Summer			Total		
		< 120 cm fl	>= 120 and <137 cm fl	>= 137 cm fl	< 120 cm fl	>= 120 and <137 cm fl	>= 137 cm fl	< 120 cm fl	>= 120 and <137 cm fl	>= 137 cm fl
Sandbar	Florida east coast	8% (82)	14% (143)	78% (798)	0.7% (2)	7.5% (19)	91.6% (230)	6.6% (84)	12.7% (162)	80.6% (1028)
	Florida Gulf Coast	0.1% (2)	4.1% (49)	96% (1146)	--	7% (33)	93% (441)	< 0.1% (3)	5% (82)	95% (1587)
	Georgia/South Carolina	--	9.5% (2)	90% (19)	--	7% (2)	93% (26)	--	7.8% (4)	88% (45)
	North Carolina	61% (3143)	15.2% (783)	23.4% (1203)	17.5% (157)	17.5% (157)	65% (579)	54.8% (3300)	15.6% (940)	29.6% (1782)
	Total	**43.7% (3227)**	**13.3% (977)**	**43% (3166)**	**9.6% (159)**	**12.8% (211)**	**77.5% (1276)**	**37.5% (3387)**	**13.2% (1188)**	**49.2% (4442)**
Blacktip	Florida east coast	30.3% (120)	38.7% (153)	30.8% (122)	61.6% (146)	20.6% (49)	17.7% (42)	42.1% (266)	31.9% (202)	25.9% (164)
	Florida Gulf Coast	63.6% (300)	29.6% (140)	6.8% (32)	81.2% (220)	15.8% (43)	3% (8)	70% (520)	24.6% (183)	5.3% (40)
	Georgia/South Carolina	–	–	–	60.2% (41)	22% (15)	17.6% (12)	56.9% (41)	20.8% (15)	60.2% (41)
	Louisiana	48.4% (135)	33.7% (94)	17.9% (50)	–	–	–	48.4% (135)	33.7% (94)	17.9% (50)
	North Carolina	38.1% (37)	60.8% (59)	1% (1)	48.5% (52)	32.7% (35)	18.6% (20)	43.6% (89)	46.1% (94)	10.2% (21)
	Total	**47.6% (592)**	**35.8% (446)**	**16.5% (205)**	**67.2% (459)**	**20.7% (142)**	**12% (82)**	**54.5% (1051)**	**30.5% (588)**	**15% (287)**
Dusky	Florida east coast	41% (37)	1% (1)	58% (52)	16.6% (1)	–	83.3% (5)	39.6% (38)	1% (1)	59.3% (57)
	Florida Gulf Coast	–	–	100% (10)	–	–	100% (7)	–	–	100% (17)
	North Carolina	64.3% (509)	3% (23)	32.7% (259)	7% (11)	2% (3)	91% (142)	54.9% (520)	2.7% (26)	42.3% (401)
	Total	**61.2% (546)**	**2.7% (24)**	**36% (321)**	**7.1% (12)**	**1.7% (3)**	**91.1% (154)**	**52.6% (558)**	**2.5% (27)**	**44.8% (475)**

Species	Region	Winter			Summer			Total		
		< 120 cm fl	>= 120 and <137 cm fl	>= 137 cm fl	< 120 cm fl	>= 120 and <137 cm fl	>= 137 cm fl	< 120 cm fl	>= 120 and <137 cm fl	>= 137 cm fl
Spinner	Florida east coast	50% (28)	16.1% (9)	33.9% (19)	62.5% (5)	–	37.3% (3)	51.5% (33)	14.1% (9)	34.4% (22)
	Florida Gulf Coast	5.7% (2)	8.6% (3)	85.7% (30)	–	–	–	5.7% (2)	8.6% (3)	85.7% (30)
	Louisiana	55.2% (16)	24.1% (7)	20.7% (6)	–	–	--	55.2% (16)	24.1% (7)	20.7% (6)
	North Carolina	13.3% (2)	13.3% (2)	73.3% (11)	33.3% (1)	–	66.6% (2)	16.7% (3)	11.1% (2)	72.2% (13)
	Total	**35.5% (48)**	**15.5% (21)**	**48.8% (66)**	**54.5% (6)**	**(0)**	**45.5% (5)**	**37% (54)**	**14.4% (21)**	**48.6% (71)**
Silky	Florida east coast	93% (40)	–	7% (3)	52% (13)	--	40% (10)	80.3% (53)	–	19.7% (13)
	Florida Gulf Coast	95.5% (64)	3% (2)	1.5% (1)	81.8% (27)	12.1% (4)	6.1% (2)	91% (91)	6% (6)	2% (2)
	North Carolina	–	–	–	40.5% (15)	10.8% (4)	40.5% (15)	44.1% (15)	11.7% (4)	44.1% (15)
	Total	**94.5% (104)**	**1.8% (2)**	**3.6% (4)**	**61.1% (55)**	**8.8% (8)**	**30% (27)**	**79.5% (159)**	**5% (10)**	**15% (30)**

As this overall percentage reduction substantially exceeds the necessary reduction of 22 percent in number of fish, no overall ridgeback LCS quota reduction (from 642 mt dw) is warranted at this time. However, due to concerns regarding the less productive dusky shark and bycatch of ridgeback LCS less than 137 cm FL, no quota increase is warranted at this time either. A ridgeback LCS commercial quota of 642 mt dw in combination with a 137-cm FL minimum size will meet the selected rebuilding program objectives and meet NS 1 and 9 requirements to rebuild overfished fisheries and minimize bycatch and bycatch mortality.

No minimum size for non-ridgeback LCS is established due to the inability to target adult stages/sizes of blacktip sharks. The non-ridgeback LCS quota will need to be reduced from the roughly 50 percent of the current LCS quota of 1,285 mt dw by approximately 66 percent by weight to 218 mt dw in order to be consistent with the selected rebuilding program (Tables 3.18 and 3.21).

Table 3.21 Ridgeback LCS and Non-Ridgeback LCS commercial quotas (mt dw) for 1999+ under final action.

Year	Ridgeback LCS Quota	Non-Ridgeback LCS Quota	Total LCS Quota	Reduction from 1997 Quota
1999+	620 (642- 22 mt dw*)	196 (218- 21 mt dw*)	860	33%

*includes accounting for 60 mt ww (43 mt dw) public display and scientific research quota.

Social and Economic Impacts

The social impacts of this action will be substantial due to the potential changes in fishery operation from a minimum size on ridgeback LCS and due to magnitude of the non-ridgeback LCS quota reduction necessary to achieve rebuilding to maximum sustainable yield levels. While a minimum size with a status quo quota for ridgeback LCS should enable fishermen to continue to target and land the same quantity of ridgeback LCS, this action may substantially change how the fishery operates. For example, pushing fishermen further offshore to target adult fish will likely increase the number of days per trip but, depending on derby fishing conditions, may or may not reduce the number of trips per season and may or may not reduce the length of the season. Thus, there may be substantial changes to how this fishery operates that may result in many directed commercial shark fishermen leaving the fishery. Evidence available to NMFS indicates that some fishermen have already left the shark fishery as a result of the 1997 LCS quota reduction. Given the additional costs associated with fishing offshore and the additional reductions in quota for non-ridgeback LCS, those fishermen who were operating at the margin under 1997 quota levels may cease being viable operations under this rebuilding program. A permanent loss of fishermen and community infrastructure may also result from this action.

This action is economically severe in the short term. It has larger estimated present values than the alternative to establish ridgeback and non-ridgeback LCS without a ridgeback LCS minimum size. The present value of gross revenues is estimated to be $31.8 million while the present value of net revenues would be between $5.6 and $6.6 million for a increase from the status quo baseline of 49.2 percent (see Chapter 7). In the short term, this action may increase the cost of fishing as the minimum size on ridgeback LCS may push fishermen farther offshore. This may increase the amount of fuel needed per trip or decrease the amount of time spent fishing. However, larger fish tend to be more valuable than smaller fish, both in terms of meat and fin value. Thus, the extra cost of fuel and time spent steaming may be offset by the additional value of the larger fish. Also, the season might lengthen due to the minimum size on ridgeback LCS, which may help to alleviate current market glut conditions and improve ex-vessel prices. In the long term, this action will allow species to rebuild at different rates, thus shortening, compared to status quo, the rebuilding time to a economically viable fishery without market gluts and short seasons (see Chapter 7 for more details).

The economic impacts of a sandbar-based minimum size for ridgeback LCS may be pronounced in the North Carolina region, and particularly in the winter season, as this fishery has increasingly targeted juvenile and subadult sandbar and dusky sharks over the past few years.

Conclusion

This action is selected because it is expected to meet NS 1 to prevent overfishing and rebuild overfished fisheries, NS 9 to minimize bycatch and bycatch mortality, and NS 8 to ensure continued participation by traditional fishing communities, to the extent practicable.

Rejected Options for Commercial Quotas for Large Coastal Sharks

Rejected Option: Status quo (maintain LCS management group as a single group; commercial quota of 1,285 mt dw per year)

This alternative would maintain the current LCS management group of those species authorized for retention as a single group. This alternative would also maintain the current commercial quota of 1,285 mt dw per year.

Ecological Impacts

This alternative would result in a continuing decline in LCS to one percent and seven percent of carrying capacity within ten years under the baseline and alternative catch series scenarios, respectively. There is a 98- to 100-percent probability that LCS stocks would decline to below 20 percent of carrying capacity, and a zero- to three-percent probability that LCS stocks would increase from the 1998 population levels within ten years under the baseline and alternative catch series scenarios, respectively (see Table 3.10). This alternative would not meet NS 1 to prevent overfishing and rebuild overfished fisheries.

Social and Economic Impacts

As LCS would continue to decline, this alternative has safety at sea concerns and would result in worsening derby fishing conditions and increasingly unpredictable fishing seasons and prices. These conditions would continue to worsen as the fishery becomes less viable, with an increasing number of fishermen leaving the fishery. Eventually, the LCS fishery would cease being commercially viable and the directed fishery, with its fishermen and communities, would essentially be eliminated. This alternative would not meet NS 8 to ensure continued participation by traditional fishing communities, to the extent practicable.

In the short term, the same economic problems in the fishery that exist now (market gluts, derby fishery, short seasons) would continue. However, over the long term, the severity of the current economic problems would increase as stock levels continued to decline.

Two different present value analyses of gross revenues were examined for this alternative, each corresponding to a different scenario regarding attainable quota levels. Under the first scenario, the current quota, and therefore the harvest, remained at 1,285 mt dw for 30 years. The present value of gross revenues is estimated to be $41.3 million. The present value of net revenues is estimated to be between $7.4 and $8.8 million (see Chapter 7). Under the second scenario, the quota is assumed to be unattainable due to decreasing stock levels. For this alternative, the current quota was reduced by ten percent each year to reflect declining catches (the quota would not be met). Ten percent is the reduction in abundance estimated per year by looking at the Bayesian model projections from the 1998 SEW Final Report. A ten percent reduction each year for 30 years reduces the quota a total of 96 percent. This is similar to the 94-percent reduction estimated from the status quo level (217 thousand fish) to the expected landings per year in 30 years (13.8 thousand fish) projected in the 1998 SEW Final Report. With the ten percent annual reduction, the present value of gross revenues is estimated to be $19.3 million while the present value of net revenues is estimated to be between $3.4 and $4.1 million (see Chapter 7). This second scenario will be used as the baseline status quo for the present value analysis because the quota is not expected to be met under the status quo during each year of the rebuilding period due to ongoing decline of the stock. Thus, while some of the following alternatives discuss quota reductions, they may indicate *increases* from the status quo estimates of the present value of gross and net revenues because they assume that the entire quota under consideration can be landed during each year of rebuilding.

Other options would include reducing the current quota by different amounts. These options may increase the severity of short-term economic impacts. However, not all of these options would minimize the long-term impact. The present values of some of these options are shown in Chapter 7.

Conclusion

This alternative is rejected because it would not meet NS 1 to prevent overfishing and rebuild overfished fisheries or NS 8 to ensure continued participation by traditional fishing communities, to the extent practicable, because the LCS stocks would continue to decline.

Rejected Option: Maintain LCS management group as a single group and reduce the quota by an additional 50 percent to 642 mt dw per year

This alternative would maintain the LCS management group of those species authorized for retention as a single group but would reduce the commercial quota of 1,285 mt dw per year by 50 percent to 642 mt dw per year.

Ecological Impacts

This alternative would result in a continuing decline in LCS to between seven and 12 percent of carrying capacity within ten years under the baseline catch series scenario, and between 13 and 17 percent of carrying capacity within ten years under the alternative catch series scenario. There is a 71- to 97-percent probability that LCS stocks would decline to below 20 percent of carrying capacity, and a zero percent probability that LCS stocks would increase from the 1998 population levels within ten years under the baseline and alternative catch series scenarios under this alternative (see Table 3.10). This alternative would not meet NS 1 to prevent overfishing and rebuild overfished fisheries.

Social and Economic Impacts

Because LCS would continue to decline, this alternative would result in rapidly worsening derby fishing conditions and increasingly unpredictable fishing seasons and prices, with the fishery becoming progressively less viable and an increasing number of fishermen being forced out of the fishery. Eventually, the LCS fishery would cease being commercially viable and the directed fishery, with its fishermen and communities, would essentially be eliminated as the LCS stocks decline to decline. This alternative has safety at sea concerns due to the worsening derby fishing conditions.

This alternative may have severe economic impacts. In the short term, many shark fishermen may cease operations. In the long term, under this alternative, LCS will rebuild more quickly than under the status quo and will return to an economically viable fishery. The expected gross revenues from this alternative are \$20.6 million with expected net revenues between \$3.7 and \$4.4 million (see Chapter 7). This alternative increases the net revenues from the status quo baseline by seven percent. The status quo assumes that the status quo quota (1,285 mt) is not sustainable for each year of the rebuilding period. Thus, in the analysis of the status quo alternative, the estimates of annual landings and the present value of gross and net revenues is adjusted to account for continued decline of the stock. While this alternative would lead to continued decline of the stock, it is feasible that the entire quota amount could be caught each year. Thus, this alternative represents an economic increase from the status quo because landing of the full quota is included for each year of rebuilding in the estimates of the present value of gross and net revenues.

Conclusion

This alternative is rejected because it would not meet NS 1 to prevent overfishing and rebuild overfished fisheries.

Rejected Option: Maintain LCS management group as a single group and close the directed commercial fishery

This alternative would maintain the LCS management group of those species authorized for retention as a single group but would reduce the commercial quota of 1,285 mt dw per year to zero. All LCS encountered incidental to other fishing operations would have to be released in a manner that ensured the maximum probability of survival.

Ecological Impacts

This alternative would provide for the fastest rebuilding possible with 46-percent and 39-percent probabilities of LCS reaching maximum sustainable yield levels in 30 years under the baseline and alternative catch series scenarios, respectively (see Table 3.10). This alternative provides near 100-percent probabilities that LCS stocks will increase from the 1998 levels and provides 42-, 14-, and 4-percent probabilities that LCS stocks would decline to 20 percent of carrying capacity over the next ten, 20, and 30 years, respectively, under the baseline catch series scenario. This alternative would increase bycatch of LCS in incidental fisheries as LCS stocks rebuild, and thereby potentially slow the recovery to maximum sustainable yield levels, unless measures were taken in those incidental fisheries to reduce LCS bycatch. This alternative would meet NS 1 to prevent overfishing and rebuild overfished fisheries; however, as discussed below, it may have unnecessarily large adverse impact on directed shark fishery participants.

Social and Economic Impacts

This alternative would have the most immediate and severe impacts on fishermen and directed commercial LCS fishing communities, although this alternative would result in the quickest return to an economically viable LCS fishery. Given that LCS as an aggregate will likely require decades to reach maximum sustainable yield levels, those fishermen that are dependent on LCS fishing are unlikely to be able to participate in a future fishery. In the interim, those communities in which directed LCS fishing is important are likely to have replaced the revenue-generating shark fishing component with another revenue-generating source and the infrastructure (dealers, processors, marine supply stores) that supported shark fishing may be permanently lost. This alternative does not meet NS 8 because practicable alternatives exist that meet conservation and rebuilding objectives while reducing adverse impacts on fishermen and fishing communities.

This alternative has the most severe economic impacts. In the short term, many shark fishermen would have to cease operations. In the long term, this alternative would lead to the fastest return to an economically viable LCS fishery. A closure for 30 years will have a gross revenue and net revenue present value of zero. The projection of 30 years for the LCS aggregate from the 1998 SEW Final Report suggests this may not be long enough to rebuild the stock. However, the sandbar baseline and blacktip baseline analyses from the 1998 SEW Final Report suggest the two stocks may be rebuilt in 20 years under zero fishing with 62-percent probability (see Tables 3.13 and 3.16). Under this alternative, if the fishery is closed for 20 years and then re-opened, the present value of gross revenues is $6.4 million, while the present value of net revenues is between $1.1 and $1.4 million (see Chapter 7). This alternative assumes the fishery would re-open in 20 years under 1997 quota levels. This alternative reduces the net revenues from the status quo baseline by 67 percent.

Conclusion

This alternative is rejected due to the fact that it does not meet NS 8 requirements because practicable alternatives exist that meet conservation and rebuilding objectives while reducing adverse impacts on fishermen and fishing communities.

Rejected Option: Separate the LCS management group into ridgeback and non-ridgeback LCS with each subgroup having separate and reduced quotas of 591 and 218 mt dw, respectively

This alternative would subdivide the LCS management group into a ridgeback LCS subgroup and a non-ridgeback LCS subgroup. This alternative would also split the LCS aggregate quota into separate ridgeback LCS and non-ridgeback LCS quotas, based on historical landings, and reduce them to 591 and 218 mt dw, respectively. This alternative is similar to the final action but would not establish a minimum size and would reduce the quota for ridgeback LCS.

Ecological Impacts

The rationale for this alternative follows that developed for the final action and would be a next step towards species-specific management and responds to the 1998 SEW recommendation that "[e]very effort should be made to manage species separately" and to NMFS's goal of minimizing economic impacts on fishermen and communities, to the extent practicable. To determine the level of landings by subgroup that is consistent with the selected rebuilding program (see above), the sandbar-based ridgeback LCS commercial quota would need to be reduced by 22 percent by number and by eight percent by weight, and the blacktip-based non-ridgeback LCS commercial quota would need to be reduced by 63 percent by number and 66 percent by weight, relative to 1997 landings levels (Tables 3.15 and 3.18). Thus, the ridgeback LCS commercial quota would be 591 mt dw and the non-ridgeback LCS quota would be 218 mt dw. This rebuilding program would maintain these constant quotas for approximately 30 years (based on the selected rebuilding time frames based on "zero plus one generation time"), or until otherwise adjusted (Table 3.22). Because this alternative would not establish a minimum size for ridgeback LCS, which would push fishing effort offshore out of areas where small sandbar and dusky sharks predominate, the reductions in fishing mortality on sensitive smaller fish and depleted dusky sharks would not be as great as that under the final action. This alternative would likely increase bycatch and bycatch mortality as the fishing seasons for ridgeback and non-ridgeback LCS would be closed for extended periods, rendering these sharks bycatch during fishery closures. Depending on the magnitude of such bycatch and bycatch mortality, management measures to reduce fishing mortality in incidental fisheries may be warranted.

Table 3.22 Ridgeback LCS and non-ridgeback LCS commercial quotas (mt dw) for 1999+ under alternative with quotas only.

Year	Ridgeback LCS Quota	Non-Ridgeback LCS Quota	Total LCS Quota	Reduction from 1997 Quota
1999+	591	218	809	37%

Social and Economic Impacts

The social impacts of this alternative would probably be severe due to the magnitude of quota reductions necessary to achieve rebuilding to maximum sustainable yield levels. Many directed commercial shark fishermen would likely leave the shark fishery under such reduced quotas. Evidence available to NMFS indicates that some fishermen have already left the shark fishery as a result of the 1997 LCS quota reduction. Given additional reductions, those fishermen who were operating at the margin under 1997 quota levels would likely cease being viable operations under this rebuilding program. As with the alternative to close the directed fishery, a permanent loss of fishermen and community infrastructure may result from this alternative.

This alternative would allow for some continued fishing but in the short term would not alleviate market gluts, short fishing seasons, other current economic problems, or safety at sea concerns. However, in the long term, this alternative would allow for a viable fishery for some species. The present value of gross revenues of this alternative is estimated to be $25.7 million, while the present value of net revenues is estimated to be between $4.5 and $5.4 million (see Chapter 7). This is a reduction in net revenues from the status quo of 31.4 percent, assuming the status quo baseline quota could be attained over 30 years.

Conclusion

This alternative is rejected because of the greater ecological benefits and lesser social and economic impacts expected from establishing a minimum size on ridgeback LCS in addition to separate quotas for ridgeback and non-ridgeback LCS.

Rejected Option: Separate LCS management group into ridgeback and non-ridgeback LCS; establish a minimum size and maintain the quota on ridgeback LCS at 642 mt dw per year; establish a separate, phased-in quota reduction on non-ridgeback LCS of 218 mt dw per year

As in the final action, this alternative would subdivide the LCS management group into a ridgeback LCS subgroup and a non-ridgeback LCS subgroup. This alternative would also split the LCS aggregate quota into separate ridgeback LCS and non-ridgeback LCS quotas, based on historical landings, and establish a minimum size restriction and no reduction in quota for ridgeback LCS (maintain quota at 642 mt dw per). However, unlike the final action, this alternative would reduce the non-ridgeback quota to 218 mt dw per year by increments over a period of five years.

Ecological Impacts

This alternative follows the same rationale as that developed for the final action, with the addition of phased-in quota reduction for non-ridgeback LCS. The rationale for this phased-in reduction of approximately 13 percent (from 642 mt dw) per year through 2003 (five years) is to minimize the adverse economic impacts (Table 3.23). This reduction would extend the time needed to reach maximum sustainable yield levels.

Table 3.23 Ridgeback LCS and non-ridgeback LCS commercial quotas (mt dw) 1999 - 2003+ incorporating 13-percent reduction (approximately 85 mt dw) in quota for non-ridgeback LCS per year.

Year	Ridgeback LCS Quota	Non-ridgeback LCS Quota	Total LCS Quota	Reduction from 1997 Quota
1999	642	557	1,199	6%

2000	642	472	1,114	13%
2001	642	387	1,029	20%
2002	642	302	944	26%
2003+	642	218	860	33%

Social and Economic Impacts

The social impacts of this alternative would probably be substantial due to the potential changes in fishery operation from a minimum size on ridgeback LCS and due to magnitude of the non-ridgeback LCS quota reduction necessary to achieve rebuilding to maximum sustainable yield levels. However, the severity of the impacts of the quota reduction on non-ridgeback LCS fisheries would likely be moderated due to the incremental phase-in of that quota reduction, allowing time for fishermen and their communities to adapt to more restrictive regulations.

This alternative has slightly larger estimated present values than the final action. The present value of gross revenues is estimated to be $32.9 million while the present value of net revenues would be between $5.8 and $6.9 million for a increase from the status quo baseline of 39.7 percent (see Chapter 7).

Conclusion

This alternative is rejected due to NMFS' concerns that phased-in quota reductions may not be appropriate for species or species complexes that require such long rebuilding periods. Additionally, NMFS reduced the LCS commercial landings in 1993 when the original Shark FMP was established and maintained that landings level until 1997 when NMFS reduced the LCS commercial quota again as an interim measure pending the establishment of a long-term rebuilding program. NMFS believes that the 1993 quota and 1997 interim reduction have already essentially phased in the reductions necessary for rebuilding LCS and that no further phase-in is warranted.

Rejected Option: Separate LCS management group into ridgeback and non-ridgeback LCS; establish a minimum size and maintain the quota on ridgeback LCS at 642 mt dw per year; reduce the quota for non-ridgeback LCS to zero

As in the final action and rejected options above, this alternative would subdivide the LCS management group into a ridgeback LCS subgroup and a non-ridgeback LCS subgroup; split the LCS aggregate quota into separate ridgeback LCS and non-ridgeback LCS quotas, based on historical landings; and establish a minimum size restriction and no quota reduction for ridgeback LCS (maintain quota at 642 mt dw per year). However, this alternative would reduce the non-ridgeback LCS quota to zero. All non-ridgeback LCS would have to be released in a manner that would ensure the maximum probability of survival.

Ecological Impacts

The rationale for this alternative follows from that developed from the final action and rejected options above, with the primary difference that the quota for non-ridgeback LCS would be reduced to zero for 20 years until non-ridgeback LCS are rebuilt to maximum sustainable yield levels. This alternative would result in the fastest rebuilding for the non-ridgeback LCS as the only source of mortality would be bycatch. However, as with the rejected option to close the fishery, bycatch and the associated bycatch mortality would increase as the non-ridgeback LCS stock increases, and thereby potentially slowing the recovery to maximum sustainable yield levels, unless measures were taken in those incidental fisheries to reduce that bycatch.

Social and Economic Impacts

This alternative would likely have impacts similar to those discussed under the final action and the rejected option to close the entire LCS fishery. Those fishermen and communities that target primarily ridgeback LCS would likely experience impacts similar to those under the final action (ridgeback LCS minimum size and no quota reduction), whereas those fishermen and communities that target primarily non-ridgeback LCS would likely experience impacts similar to those under the rejected option to close the fishery. As discussed under those alternatives, the social impacts from this alternative would likely be substantial.

The economic impacts of this alternative would be severe in the short term. Current economic problems would be exacerbated especially in terms of extreme market gluts and shortened seasons. However, in the long term, this alternative would allow for a shorter time to recovery than status quo for both species subgroups. This alternative assumes that the non-ridgeback LCS fishery reopens in 20 years with approximately half of the 1997 quotas (642 mt dw). The present value of gross revenues for this alternative is estimated to be $23.9 million while the present value of net revenues is estimated to be between $4.2 and $5.0 million (see Chapter 7). This alternative leads to an increase of 22 percent from the baseline net revenues of the status quo.

Conclusion

This alternative is rejected due to the existence of practicable alternatives that meet conservation and rebuilding objectives while reducing adverse impacts on fishermen and fishing communities.

3.4.1.3.2 Pelagic Sharks Commercial Quota Alternatives

Final Action: Establish a species-specific quota for porbeagle sharks of 92 mt dw; Reduce pelagic shark quota by 92 mt dw to 488 mt dw.

This action establishes a separate quota of 92 mt dw for porbeagle sharks, based on data submitted by the Portland Fish Exchange, Inc., and would reduce the pelagic shark quota accordingly. The porbeagle quota of 92 mt dw is approximately ten percent higher than the highest annual porbeagle landings (about 83 mt dw) from 1990 to 1998. The final action will allow limited opportunities for fishery expansion but will establish separate controls on this segment of the pelagic shark commercial fishery.

In the draft HMS FMP, NMFS presented data and figures on porbeagle shark landings that are currently under revision due to the submission of additional data and comments from the New England Fishery Management Council and the State of Massachusetts. NMFS is implementing a porbeagle shark quota of 92 mt dw, which is based on the highest landings data currently available, as a balance between establishing separate controls on this species and minimizing social and economic impacts, pending additional assessment.

Ecological Impacts

Pending additional scientific analyses, it cannot be determined whether current levels of fishing mortality on porbeagle sharks are sustainable. If porbeagle shark stocks are at optimum yield levels, this action would be consistent with NS 1 to preventing overfishing but may increase bycatch if the separate quota resulted in fishery closures and regulatory discards. If porbeagle shark stocks are below optimum yield levels, this action would not contribute to rebuilding and may result in harvest restrictions in the future.

Social and Economic Impacts

This action may have social impacts depending on the magnitude of incidental catches and landings in other fisheries. If a separate quota resulted in directed fishery closures due to high incidental catches, derby fishing conditions may develop with associated market gluts, unstable markets, and safety concerns. However, porbeagle sharks are not the targeted species for most pelagic fisheries and, while fishermen may have a fundamental disagreement with regulatory discards, the loss of income from incidental porbeagle shark catches is unlikely to have a substantial impact. To the extent that porbeagle shark stocks are declining under current harvest levels, this action will not mitigate any adverse social impacts in the future.

This action will likely have little economic impact as fishermen and fishing communities are currently operating below these quota levels. This action will limit the potential for expansion of directed fishing for porbeagle sharks, and depending on the incidental catches and landings of porbeagle sharks in other fisheries, may result in decreases in directed porbeagle fishing opportunities.

Conclusion

This action is selected because porbeagle sharks are known to be highly susceptible to overfishing and because shifts in fishing effort may result in increased fishing mortality on species not previously targeted. Due to the limited potential for porbeagle sharks to sustain large-scale directed fishing mortality, this action will maintain the traditional directed fishery while preventing increases in landings from current levels. NMFS may revisit the porbeagle shark quota levels pending further information and/or stock assessments.

Final Action: Establish a separate quota for blue sharks of 273 mt dw; Reduce pelagic shark quota by overharvests in blue shark quota

This action addresses concerns regarding the high numbers of blue sharks caught and discarded in the pelagic longline fisheries by creating an incentive to reduce blue shark dead discards. This action will also mitigate the potential development of a "vicious cycle" in which all pelagic sharks become regulatory discards as a result of counting dead discards against the quota (as the available quota is reduced because of dead discards, the fishery may experience extended closures in which all pelagic sharks are discarded, thereby increasing the estimates of dead discards which must be counted against an ever smaller quota).

This action establishes a separate allowance for blue sharks (NOTE: this action does not implement the prohibition on possession of blue sharks, as was proposed in the draft HMS FMP). The 273 mt dw quota for blue sharks is equivalent to the average weight of blue sharks discarded dead by longline fisheries targeting tunas and swordfish for the period 1987 to 1997 (see Chapter 2). Commercial landings of blue sharks have ranged from less than 1 mt dw to 4.6 mt dw, and averaged 1.1 mt dw, from 1987 to 1997. If landings and dead discards of blue sharks exceed the 273 mt dw quota, then that overharvest will be deducted from the pelagic shark quota the following year.

This action may substantially reduce the available commercial quota because current estimates of blue shark dead discards can constitute a large proportion of the pelagic shark quota (62 percent in 1996 vs. 19 percent in 1997, see discussion in Chapter 2). However, this action should mitigate the reductions in the pelagic shark quota as a result of blue shark dead discards by establishing a separate quota for that species against which landings and dead discards will be counted, thereby the lessening the reduction required. Nevertheless, this action may still reduce the available pelagic shark quota because the magnitude of blue shark landings and dead discards catches can still be higher than the selected quota.

Catches of blue sharks are unlikely to decrease because they are not the target species but are caught incidentally to fishing operations targeting tunas and swordfish. Without changes in fishing patterns (areas fished, gear, bait) in those other fisheries, blue sharks will continue to be caught and some discarded dead. To the extent that effort restrictions in those fisheries (quota reductions, time/area closures) reduce the incidental catches of blue sharks, dead discards may decrease. Additionally, the majority of blue sharks can be released alive (Cramer, 1996) such that this action will increase the incentive to maximize the survival of all incidentally caught blue sharks.

Ecological Impacts

This action may have ecological impacts if large reductions in the pelagic shark quota result from exceeding the blue shark quota. The fact that high proportions of the discarded blue sharks are discarded alive indicates that increases in dead discards of blue sharks may not occur. To the extent that this action creates an incentive to reduce blue shark dead discards so as not to reduce the pelagic shark quota, this action will have positive ecological impacts.

Social and Economic Impacts

This action may have social impacts if the available pelagic shark quota is reduced to the point that fishery closures result in derby fishing conditions. However, blue sharks and pelagic sharks are not the targeted species for these fisheries and, while fishermen may have a fundamental disagreement with regulatory discards, any loss of income from pelagic shark landings is not expected to have a substantial impact. If dead discards of blue sharks substantially exceed the blue shark quota and the pelagic shark quota is reduced significantly, this action will shorten the fishing season and may put some fishermen out of business, cause market gluts, lower ex-vessel prices, and decrease safety at sea. It may also increase variable costs and decrease gross revenues by pushing fishermen out of areas where blue sharks are abundant and into areas where the target species may be less abundant. In the long term, however, this action should increase the number of pelagic sharks available and contribute to a viable fishery.

Conclusion

This action is selected because it balances the need to monitor and account for all sources of mortality and NS 9 to reduce bycatch and minimize the mortality of unavoidable bycatch. Establishing a blue shark quota and reducing the pelagic shark quota by any overharvest of the blue shark quota should create an incentive to maximize the survival of blue sharks encountered. Furthermore, this action will reduce the likelihood that incidental catches of blue sharks would preclude a pelagic shark fishery as a result of the “vicious cycle” discussed above.

Rejected Options for Commercial Quotas for Pelagic Sharks

Rejected Option: Status quo (580 mt dw or 37 percent of the pelagic TAC).

This alternative would maintain the current management structure and allocations based on the pelagic shark management group as a single group.

Ecological Impacts

Pending additional scientific analyses, it cannot be determined whether current levels of fishing mortality are sustainable. Aggregate pelagic shark catch rates suggest that the rapid declines seen in the mid 1980s to early 1990s have slowed. However, for transoceanic species like the blue shark, catch rate indices from U.S. fisheries alone may not track relative population abundance trends with accuracy. Therefore, to the extent that current fishing mortality levels are sustainable, this alternative would not result in negative ecological impacts. If current fishing mortality rates are too high, this alternative may contribute to stock declines. However, other final actions in this FMP, including a recreational minimum size limit for all sharks and counting dead discards against the commercial quota, may reduce the overall mortality of pelagic sharks.

It is important to note that expansion of the harvesting capacity of the fishing fleet (vessel length, horsepower, gross tonnage) and the number of participants in the fishery would be limited under the limited access system for the Atlantic swordfish, tuna longline, and shark commercial fisheries. While the limited access will not limit fishing effort (number of trips, length of trips, amount of gear fished), reductions in directed fishery quotas may reduce fishing mortality rates.

Social and Economic Impacts

This alternative would not have any marginal social or economic impacts in the short term. In the long term, this alternative may have significant social or economic impacts if the stock declines.

Conclusion

This alternative is rejected because of concerns regarding the sustainability of current fishing mortality rates and the potential for increased fishing effort on those species known to have limited capacity to withstand fishing pressure (e.g., porbeagle sharks). Additionally, this alternative, in concert with the final action to count dead discards against the commercial quota, would likely result in the pelagic shark commercial fishery being eliminated as blue shark dead discards would eventually exceed a reduced commercial quota such that all pelagic sharks would become regulatory discards, contrary to the intent of NS 9.

Rejected Option: Interim reduced commercial quota pending assessment

This alternative would reduce the commercial allowable catches as a precautionary measure to ensure that fishing mortality rates are sustainable, pending further stock assessments.

Ecological Impacts

The ecological impacts of this alternative would depend on the magnitude of reductions in the commercial quota. If pelagic shark stocks are at optimum yield levels, this alternative would exceed the NS 1 requirement to preventing overfishing but would likely increase bycatch if the reduced quota resulted in fishery closures and regulatory discards. If pelagic shark stocks are below optimum yield levels, this alternative would facilitate rebuilding and potentially minimize any harvest restrictions in the future.

Social and Economic Impacts

This alternative may have social impacts depending on the magnitude of reductions in the commercial quota. If such reductions resulted in fishery closures, derby fishing conditions may develop with associated market gluts, unstable markets, and safety concerns. However, pelagic sharks are not the targeted species for these fisheries and, while fishermen may have a fundamental disagreement with regulatory discards, the loss of income from pelagic shark landings is unlikely to have a substantial impact. To the extent that pelagic shark stocks are declining under current harvest levels, this alternative would mitigate any adverse social impacts in the future by potentially minimizing the need for future harvest restrictions.

This alternative may have short-term economic impacts depending on the quota reduction and the length of time until an assessment.

Conclusion

This alternative is rejected because of the expectation of greater ecological benefits under the final action which establishes a separate porbeagle commercial quota, a reduction in the recreational retention limit with a minimum size, and accounting for all sources of mortality, consistent with the precautionary approach.

3.4.1.3.3 Small Coastal Sharks Commercial Quota Alternatives

Final Action: **Cap commercial SCS quota at ten percent higher than 1997 levels (359 mt dw) as an interim measure pending future assessment**

This action reduces the SCS quota by 80 percent to 359 mt dw, which is ten percent higher than 1997 landings of 326 mt dw, as an interim measure pending future assessment. This action follows a similar approach to that used in developing a separate quota for porbeagle sharks of ten percent higher than recent landings.

Ecological Impacts

This action will have minor ecological impacts as the landings in the SCS fishery will not be reduced. As the selected quota is still higher than 1997 landings, there is still opportunity for expansion of the current fishery. To the extent that the SCS quota is too high, this action may mitigate any reductions needed in the future. This action will likely not affect total mortality of SCS because it affects SCS landings only and does not restrict the ability of fishermen to use SCS as bait. Additional measures such as increasing observer coverage to obtain better estimates of cryptic mortality or requiring fishermen to report the catch and disposition of all SCS in addition to SCS landings may be warranted to address this issue.

Social and Economic Impacts

This action may have negative social impacts because those fishermen who appear to have begun targeting SCS in recent years will have fewer opportunities for expanding their current operations. Additionally, restrictions in both the LCS and SCS fisheries may result in the need for fishermen to diversify their operations and this action will further restrict one of the fisheries previously thought to have expansion opportunities. However, the limited access system will limit the number of fishermen in all shark fisheries and moderate any expansion in participants into the SCS fishery. Because the selected quota is higher than current landings, derby fishing conditions with associated safety concerns are not expected to develop.

This action may have negative economic impacts even though the selected quota is higher than current landings because of the loss of substantial fishery expansion that fishermen may desire due to restrictions in both the LCS and SCS fisheries.

Conclusion

This action is selected because the SCS commercial fishery landings may be substantially underestimated due to cryptic mortality and the current SCS quota may not be sustainable. This action still allows for a limited degree of fishery expansion but eliminates the potential for excessive growth. This action will facilitate maintenance of SCS at optimum levels until future stock assessments can be conducted.

Rejected Options for Commercial Quotas for Small Coastal Sharks

Rejected Option: Status quo (1,760 mt dw or 68 percent of the SCS TAC)

This alternative would maintain the current management structure and allocations as established in 1997 based on the assessment that supported the original FMP in 1993.

Ecological Impacts

To the extent that the SCS assessment in the original FMP is overly optimistic, this alternative would allow potential overfishing to continue. However, to the extent that the assessment is correct, this alternative would maintain the quota at maximum sustainable yield levels and would not result in negative ecological impacts.

It is important to note that expansions of the harvesting capacity of the fishing fleet (vessel length, horsepower, gross tonnage) and the number of participants in the fishery would be limited under the limited access system for the Atlantic swordfish, tuna longline, and shark commercial fisheries. While the limited access will not limit fishing effort (number of trips, length of trips, amount of gear fished), reductions in directed fishery quotas may reduce fishing mortality rates.

Social and Economic Impacts

This alternative would likely have few social or economic impacts as fishermen and communities are already operating under these restrictions. However, as the commercial quota has not been reached to date, this alternative would allow for expansion into this fishery for fishermen that may be displaced from other fisheries, including other shark fisheries. The increase in landings since 1995 supports that such an expansion is occurring. To the extent that the SCS quota is too high, this alternative would allow for expansion of fishing effort that may not be sustainable in the long term.

Conclusion

This alternative is rejected because of concerns regarding the sustainability of current fishing mortality rates and the potential for increased fishing effort from fishermen displaced from other fisheries.

Rejected Option: Interim reduced commercial quota pending assessment

This alternative would reduce the SCS quota as a precautionary measure to ensure that fishing mortality rates are sustainable, pending further stock assessments.

Ecological Impacts

The ecological impacts of this alternative would depend on the magnitude of reductions in the commercial quota. If SCS stocks are at optimum yield levels, this alternative would exceed the NS 1 requirement to preventing overfishing but would likely increase bycatch if the reduced quota resulted in fishery closures and regulatory discards. If SCS stocks are below optimum yield levels and the SCS quota is too high, this alternative would facilitate rebuilding and potentially minimize any harvest restrictions in the future. This alternative may not affect total mortality of SCS because this alternative would affect SCS landings only and would not restrict the ability of fishermen to use SCS as bait. Additional measures such as increasing observer coverage to obtain better estimates of cryptic mortality or requiring fishermen to report the catch and disposition of all SCS in addition to SCS landings may be warranted to address this issue.

Social and Economic Impacts

This alternative may have social impacts depending on the magnitude of reductions in the commercial quota. If such reductions resulted in fishery closures, derby fishing conditions may develop with associated market gluts, unstable markets, and safety concerns. To the extent that SCS stocks are declining under current harvest levels, this alternative would mitigate any adverse social impacts in the future by potentially minimizing the need for future harvest restrictions.

This alternative may have small short-term economic impacts depending on the quota reduction and the length of time until an assessment.

Conclusion

This alternative is rejected because of the expectation of greater ecological benefits under the final action, which caps any increases in SCS landings and should mitigate any reductions needed in the future.

3.4.1.3.4 Fishery Operations

The commercial shark fisheries are divided into two equal semiannual periods (January 1 through June 30, July 1 through December 31) with the annual available quota equally allocated to each period. Previous regulations stipulated that any overharvests or underharvests in the first period were adjusted in the second period; however, due to lack of authority to adjust quotas across years, no adjustments in available quota for overharvests or underharvests in the second period were made (although these events were incorporated into stock assessments). Previous regulations also stipulated a minimum of a five-day advance notice period from the date of filing such notice at the Office of the Federal Register and the effective date of the closure, which may not allow adequate advanced planning for fishing trips.

Before the 1997 LCS quota reduction, the LCS quota for the first period was reached in May, but was reached in early April in 1997 and at the end of March in 1998 and 1999. The LCS quota for the second period has been reduced due to overharvests in the first period in all years except 1994. The second period quota was reached in August or September before the 1997 LCS quota reduction, and was reached in three weeks in 1997 and four weeks in 1998. Depressed prices, market gluts, loss of stable markets, and safety concerns have resulted from these derby fishing conditions.

Final Action: Schedule fishery openings for specified periods; Season-specific adjustments for quota overharvests and underharvests the following year (no reopening within that season)

This action establishes opening and closing dates of the LCS fishery prior to the fishery opening, based on historical catch rates (e.g., announce that the LCS would be open from January 1 through February 15 before the fishery opened). Thus, fishermen will know in advance exactly how long the fishery will remain open. The quota will still be monitored as it is now but any quota overharvest and under-harvests will be adjusted in that season the following year (NMFS retains the authority to close the fishery if landings data significantly exceed predicted catch rates). The fishery will not reopen within that season if there is a quota underharvest.

Ecological Impacts

This action will not have direct ecological impacts. However, indirect impacts of increasing the predictability of the fishery may include greater attention to reducing bycatch rates of immature fish or other regulatory or market-driven discards as well as increasing post-release survival of bycatch. This action should reduce the incentive for fishermen to concentrate fishing efforts inshore in order to reach the retention limit and offload before the closure is effective. Fishing in inshore areas where immature sharks predominate can have several negative ecological ramifications including higher catches of immature fish and associated higher effective fishing mortality rates, increased bycatch rates of undersized fish, and higher fishing effort (with increases in bycatch of immature fish) because more small fish than large fish must be caught to reach the same weight-based quota.

It is likely that fishing effort will be shifted further offshore where larger fish predominate due to the implementation of a minimum size for ridgeback LCS; however, as derby fishing conditions persist, the incentive to minimize transit time and fish inshore will continue as well. To the extent that this action reduces the "race for fish," bycatch catch rates and post-release survival concerns may be given higher priority in determining fishing practices and areas than catching the most fish on a given trip. This action may also increase or alter bycatch rates and mortality because, although the fishery would not reopen later that season, if large adjustments are needed the following year then bycatch rates may increase (due to increased derby conditions from a reduced quota) or may be altered (due to the fishery being open longer and later in the year if the quota is increased).

Social and Economic Impacts

This action will increase the predictability of the LCS fishery by allowing more advance planning of fishing trips. Since fishermen will know in advance how long the fishery will be open, the uncertainty of sudden and unexpected fishery closures will be eliminated. This action will be unlikely to have adverse social impacts. This action also allows longer term planning of marketing and advertising for shark dealers and retailers. This action may also reduce derby fishing conditions and associate safety concerns and decrease the potential for market gluts, thereby increasing revenues. There are positive economic benefits associated with this action as compared to the status quo.

Conclusion

This alternative is selected because of the expected increase in stability and predictability in the LCS fishery, reduced safety concerns, reduced enforcement costs of a single fishery opening and closure, and possible reduction in administrative costs from less extensive inseason monitoring of the quota.

Rejected Options for Fishery Operations

Rejected Option: Status quo (five-day advance notice period)

This alternative would maintain the current requirement that NMFS provide a minimum of five days advanced notice of fishery closures from the date of filing such notice at the Office of the Federal Register and the effective date of the closure.

Ecological Impacts

This alternative would not have direct ecological impacts; however, in combination with reduced quotas, this alternative would contribute to continued derby fishing conditions. This alternative would continue to disrupt long-term planning of fishing trips and, if notice is given during a fishing trip, would create incentive for fishermen to concentrate fishing efforts inshore in order to reach the retention limit and offload before the closure is effective. It is likely that fishing effort will be shifted further offshore where larger fish predominate due to the implementation of a minimum size for ridgeback LCS; however, as derby fishing conditions persist, the incentive to minimize transit time and fish inshore will continue as well. To the extent that this alternative would contribute to the continued "race for fish," bycatch catch rates and post-release survival concerns would continue to be a lower priority in determining fishing practices and areas than catching the most fish on a given trip.

Social and Economic Impacts

This alternative would continue to contribute to the instability and unpredictability of the LCS fishery with associated safety at sea concerns. This alternative would not be expected to have additional social and economic impacts because fishermen are already operating under this restriction.

Conclusion

This alternative is rejected because of the relatively greater benefits of scheduling fishery openings for specified periods with seasons-specific adjustments for quota overharvests and underharvests the following year and increasing safety at sea (see final action).

Rejected Option: Extend the advance notice period to ten days

This alternative would increase the current advanced notice requirement by five days such that NMFS would provide a minimum of ten days advanced notice of fishery closures from the date of filing such notice at the Office of the Federal Register and the effective date of the closure.

Ecological Impacts

This alternative would not have direct ecological impacts. However, indirect impacts of increasing the predictability of the fishery may potentially include greater attention to reducing bycatch rates of immature fish or other regulatory or market-driven discards as well as increasing post-release survival of bycatch. An increase in the notice from five to ten days would result in less reliable projections of seasonal landings, which may result in increases in quota overages or maybe even underharvests. However, because season-specific quota adjustments are implemented, any increased quota overages would not result in deviations from the rebuilding schedule.

Social and Economic Impacts

This alternative would likely increase the predictability of the LCS fishery by allowing more advanced planning of fishing trips and increase safety at sea. Additionally, for fishermen whose fishing trips are longer than five days, this alternative would decrease the possibility of learning of the closure mid-trip and having to come inshore to offload any LCS before the closure. Because season-specific quota adjustments are implemented, this alternative would be unlikely to have adverse social impacts. However, this alternative may also increase the potential of overshooting the annual quota and thus, decrease any potential revenues for the following year.

Conclusion

This alternative is rejected because of the relatively greater benefits of scheduling fishery openings for specified periods with season-specific adjustments for quota overages and underharvests the following year (see final action).

Rejected Option: Schedule fishery openings for specified periods; season-specific adjustments for quota overharvests and underharvests the following year unless sufficient underharvests to allow reopening within that season

This alternative would establish opening and closing dates of the LCS fishery prior to the fishery opening, based on historical catch rates (e.g., announce that the LCS would be open from January 1 through February 15 before the fishery opens). Thus, fishermen would know in advance exactly how long the fishery would remain open. Under this alternative, the quota would monitored as it is now and any quota overharvests or underharvests would adjusted in that season the following year. Unlike the final action, this alternative would allow the fishery to reopen within a season if sufficient quota remained.

Ecological Impacts

This alternative would likely have similar ecological impacts as those discussed under the alternative to increase the advanced notice period to ten days in that increasing the predictability of the fishery may reduce bycatch rates of immature fish or other regulatory or market-driven discards as well as increase post-release survival of bycatch. Additionally, to the extent that this alternative may extend and/or shift the traditional LCS fishing season to other times of the year, bycatch rates and mortality may also be altered (increased or decreased, same or different species encountered).

Social and Economic Impacts

This alternative may increase the predictability of the LCS fishery by allowing more advanced planning of fishing trips and increase safety at sea. However, this alternative may also result in increased switching to and from shark fishing and other fishing operations if the shark fishery opens and closes multiple times. In addition to the economic costs, this alternative may also disrupt traditional fishing patterns and increase the social impacts of multiple closures.

This alternative may increase the conversion costs between gears. Currently, some fishermen switch gear during a LCS closure. Under this alternative, fishermen may be switching gears every time the fishery opens within a season. This alternative would likely increase enforcement costs and administrative burden to open and close the fishery multiple times.

Conclusion

This alternative is rejected because of the enforcement and administrative costs to open and close the fishery multiple times.

3.4.1.3.5 Overharvest/Underharvest Adjustments

Previous regulations stipulated that commercial quota overharvests or underharvests in the first semiannual period were adjusted in the second semiannual period (e.g., if the first half goes over by 25 percent of its available quota, the second half is reduced by 25 percent). However, commercial quota overharvests or underharvests in the second semiannual period were not adjusted in the first semiannual period the following year. Estimates of dead discards of sharks were included in stock assessments but overall quotas were not directly reduced by such estimates. In this way, the historically southeastern LCS fishery (the primary directed shark fishery) was apportioned the majority of the available commercial quota (because LCS tend to migrate south in winter, the fishermen in southern areas were able to catch more LCS in winter than fishermen in northern areas; by the summer, LCS are more widely dispersed so that fishermen in both areas were able to participate in the fishery). It is important to note that all shark landings (including dead discards) were incorporated into stock assessments, so while overharvests or underharvests in the second half were not adjusted into the following year's quota, the mortality was known and assessed. Under this system, pelagic and small coastal shark quota levels have not been exceeded to date and thus have not been adjusted inseason or annually. Recreational landings are evaluated and adjusted annually (there is no inseason monitoring or retention limit adjustment in the recreational shark fishery).

Final Action: Season-specific quotas and adjustments for the commercial fisheries; Annual retention limits and adjustments for recreational fisheries

This action adjusts any commercial quota overharvests or underharvests in a given period in the same period the following year, and establishes and adjusts recreational overharvests or underharvests on an annual basis.

Ecological Impacts

This action will likely allow for increased commercial fishing effort in northern areas, which may affect species and size composition of catches and landings. This action will eliminate unchecked deviations from the selected rebuilding schedule, will minimize the need for additional reductions in the future, and will provide for the benefits of an underharvest or windfall. This action eliminates commercial overharvest due to the current inability to take year-end overharvests off the next year's quota but also ensures that fishermen will be provided the opportunity to land any underharvests if the quota is not filled in a given season. This flexibility is important because NMFS will be announcing fishery seasons ahead of times and the potential for under and overharvests is increased. No additional ecological impacts are expected under this action for recreational fisheries because these fisheries are already operating under these procedures.

Social and Economic Impacts

This action may increase the incentive for commercial fishermen to submit landings reports in a manner that facilitates accurate quota monitoring. Because overharvests will be adjusted in the same period the following year, there will be more direct accountability of penalties and windfalls within a region, and will ensure that fishermen will be provided the opportunity to land any underharvests if the quota is not filled in a given season. This action should reduce or eliminate the sense of unfairness between regions in the allocation of the available quota. No additional social impacts are anticipated under this action for recreational fisheries. This action does not have significant safety concerns.

This action may have a small negative economic impact for commercial fishermen who fish in the first season and a small positive economic impact for those fishermen who fish primarily in the second season. Under previous regulations, the first season was always allowed to fish the full sub-quota. If the first season went over the allowed sub-quota, the fishery in the second half of the season was curtailed by the amount over in the first half of the season. Under this action, vessels fishing in each season will be allowed to fish for the entire sub-quota for that 6 month season. If either season goes over, its revenues will be reduced the following year as its sub-quota is reduced. Also, if either season goes under its sub-quota, its revenues the following year will be increased as its sub-quota is increased. No additional economic impacts are anticipated under this action for recreational fisheries.

Conclusion

This action is selected because it will eliminate unchecked deviations from the selected rebuilding schedule for commercial fisheries, increase direct accountability of penalties and windfalls within a region, increase the incentive for fishermen to submit landings reports in a manner that facilitates accurate quota monitoring, and reduce or eliminate the sense of unfairness between regions in the allocation of the available quota. This action is also selected for recreational fisheries because it will keep the recreational harvest levels on track under the selected rebuilding schedule.

Final Action: Account for all sources of fishing mortality in establishing quota levels, including counting dead discards and landings in state waters after Federal closures against Federal quotas

This action will account for all sources of mortality in assessing an annual harvest level and will reduce that available quota by the amount of shark discarded dead and the amount harvested in state waters after Federal fishery closures, consistent with the approach described in the introduction of Section 3.1.1. For LCS, observer data indicate that approximately ten percent of LCS caught in the directed shark fishery are discarded dead, which accounts for about 3.5 to 5.5 percent of total LCS mortality. The pelagic longline fishery, which encounters LCS incidental to other fishing operations, is estimated to account for about 1.5 to four percent of total LCS mortality. Estimates of the pelagic sharks discarded dead in the tuna and swordfish longline fisheries range from approximately 300 to 1,200 mt ww between 1987 and 1997 (about 9,000 to 30,000 fish; see discussion in Chapter 2), of which approximately 62 to 95 percent is blue sharks. Thus, estimates of dead discards of pelagic sharks have ranged from 27 to 103 percent of the commercial pelagic shark quota (for years when a quota was established), with blue shark dead discards comprising from 19 to 98 percent of the quota. When blue sharks are not included, the estimate of dead discards of pelagic sharks has ranged from eight to 20 percent of the pelagic shark quota. For SCS, observer data indicate that about 99 percent of SCS caught are either landed or used for bait, such that dead discards would be negligible. However, additional measures such as increasing observer coverage to obtain better estimates of cryptic mortality or requiring fishermen to report the catch and disposition of all SCS (not just SCS landings) may be warranted to address this issue.

Regarding state landings after Federal closures, in the first and second seasons of 1998, an additional 243 and 188 mt dw of LCS (38 and 31 percent of the available quotas), respectively, were landed in state waters after the Federal closure. In the first and second seasons of 1997, approximately 206 and 170 mt dw (32 and 52 percent of the available quotas), respectively, of LCS and unclassified sharks were landed in state waters after the Federal closures. State landings of pelagic sharks after a Federal closure would be expected to be minimal (should the Federal pelagic shark quota be reached) because fisheries for these species primarily occur in Federal waters. On the other hand, state landings of SCS after a Federal closure could be substantial (should the Federal SCS shark quota be reached) because SCS are frequently encountered in state fishing activities. A number of Atlantic coastal states have recently revised (North Carolina, Delaware, Virginia) or are in the process of revising (New Jersey, Georgia, Louisiana) their state shark regulations to be consistent or more restrictive than current Federal shark regulations.

Ecological Impacts

This action could reduce the available commercial quota significantly, which would enhance rebuilding to maximum sustainable yield levels. However, this action may result in increases in regulatory discards if quota levels are reduced and fishery closures result or if the duration of fishery closures are lengthened. For LCS, the quota reductions could range from 30 to 60 percent, which would contribute to LCS rebuilding but may essentially result in fishery closure.

For pelagic sharks, this action may substantially reduce the available commercial quota because recent estimates of dead discards have constituted a large portion of the quota. This action will likely result in increased regulatory discards, and therefore less available quota, because pelagic sharks will continue to be encountered while fishing for other species. While many of those incidental catches are released alive, the magnitude of those catches that do result in dead discards can be significant. Thus, counting dead discards against the available pelagic quota could quickly result in a "vicious cycle" in which the entire pelagic quota could become regulatory discards. It is unlikely that catches of pelagic sharks would decrease because they are not the target species but are caught incidentally to fishing operations targeting tunas and swordfish. Without changes in fishing patterns (areas fished, gear, bait) in those other fisheries, pelagic sharks will continue to be caught and some portion discarded dead. To the extent that effort restrictions in those fisheries (quota reductions, time/area closures, limited access) reduce the incidental catches of pelagic sharks, dead discards may decrease. Additionally, the final action to establish a separate blue shark quota would lessen any reductions in the pelagic shark quota necessary, thereby likely allowing the fishery to continue.

Social and Economic Impacts

This action will likely have substantial social impacts where dead discards comprise a large portion of the currently available quota. Decreases in available quotas are likely to worsen derby fishing conditions, with associated safety concerns, and extend fishery closures. This action may then increase the instability in shark markets and prices. However, pelagic sharks are not the targeted species for these fisheries and, while fishermen may have a fundamental disagreement with regulatory discards, the loss of income from pelagic shark landings is unlikely to impact them substantially. To the extent that this action enhances rebuilding to maximum sustainable yield levels, it will result in a faster return to economically viable and stable shark fisheries.

Regarding state landings after Federal closures, this action will likely have substantial social impacts if shark landings in state waters after Federal closures comprise a large portion of the currently available quota. Decreases in available quotas are likely to worsen derby fishing conditions, with associated safety concerns, and extend fishery closures, thus increasing the instability in shark markets and prices. However, to the extent that this action enhances rebuilding to maximum sustainable yield levels, it will result in a faster return to economically viable and stable shark fisheries. On the other hand, this action may create further incentive for fishermen to cancel their Federal commercial shark permits in order to fish in less restrictive or unregulated state waters. This action may also penalize those fishermen who retain their Federal permits by reducing the commercial quota available to them due to fishing operations outside of NMFS' jurisdiction. These concerns may be mitigated or exacerbated by the implementation of limited access, depending on the degree to which fishermen cancel or retain their Federal permits. The impacts of this final action would also be mitigated as states implement regulations to close state waters when the Federal seasons close.

This action may have significant economic impacts, especially if dead discard rates are high. For LCS, approximately five to ten percent of LCS caught are discarded dead by the directed shark and pelagic tuna/swordfish fisheries. Thus, this action could result in reduced revenues for those vessels. For pelagic sharks, this action may have severe economic impacts as dead discards, particularly of blue sharks, regularly comprise large proportions of the quota. The final action to establish a blue shark quota should minimize any reductions in the pelagic shark quota. However, should dead discards of blue sharks exceed the quota and result in a large reduction in the pelagic shark quota, this action may put some fishermen out of business, shorten the fishing season, cause market gluts, lower ex-vessel prices, and decrease safety at sea. It may also increase variable costs and decrease gross revenues by pushing fishermen out of waters where sharks are abundant and into waters where target species may also be less abundant. In the long term, however, this may increase the number of LCS and pelagic sharks available and more quickly rebuild a viable fishery. For SCS, this action will likely have negligible economic impacts because approximately 99 percent of SCS are retained.

Counting landings from state waters after Federal closures may have a severe impact on Federally permitted shark fishermen. Currently, many states continue to allow their fishermen to land LCS after a Federal closure. When these landings are counted against the next year's Federal quota, the already short Federal shark seasons is likely to become even shorter. Landings of LCS and unclassified sharks in state waters after Federal closures are high enough that, in combination with counting dead discards against the quota, Federal waters may not even open under this action. This will force Federal shark fishermen out of business or force them to drop their Federal permit and fish only in state waters.

Conclusion

This action is selected because it will account for all sources of mortality in determining annual quota levels, greatly enhance rebuilding to maximum sustainable yield levels, and reduce any deviations from the selected rebuilding schedules that may result from overestimated harvest levels as a result of underestimating all sources of mortality.

Rejected Options for Overharvest/Underharvest Adjustments

Rejected Option: Status quo (inseason quota monitoring; commercial quota overharvests and underharvests in first semiannual period adjusted in second semiannual period quota; no adjustment of second semiannual period; no corresponding reductions of commercial quotas from dead discards; recreational overharvests and underharvests assessed and adjusted annually)

This alternative would continue to allow harvest levels to be exceeded in the second period without a corresponding reduction in available quota. This system has contributed to the need for frequent adjustments to quota levels.

Ecological Impacts

This alternative would sustain the need for periodic reductions in quota levels in excess of the selected reductions in order to bring any overharvests in line with the scheduled quotas under the selected rebuilding program, and may delay rebuilding of LCS to maximum sustainable yield levels. Additionally, the lack of direct accounting of dead discards against the quotas contributes to the need for periodic reductions in quota levels and may also delay rebuilding of LCS to maximum sustainable yield levels. To the extent that fishery closures result in underharvests in the second period, this alternative would also not allow for a corresponding increase or windfall in the following period. Finally, this alternative could slow rebuilding of LCS by failing to account for quota overharvests, and thus, mortality in excess of that prescribed by the rebuilding schedule, that could occur during the second annual quota period.

Social and Economic Impacts

This alternative would perpetuate beliefs that the northern fishermen and communities are unfairly penalized for commercial quota overharvests in southern areas. This alternative, in combination with severe derby conditions and associated safety concerns, has also created incentives to submit landings reports late in order to delay fishery closures and "get a fair share" of the quota, especially because there is no adjustment for underharvests in the second period. No additional economic impacts are expected in short term. In the long term there may be significant negative economic impacts if the stock does not rebuild.

Conclusion

This alternative is rejected because it fails to account for all sources of mortality in establishing quota levels. This alternative would likely result in deviations from the rebuilding schedule and delays in rebuilding LCS stocks to maximum sustainable yield levels.

Rejected Option: Establish regional and/or state quotas

This alternative would establish separate regional or state harvest levels based on historical landings in shark fisheries.

Ecological Impacts

This alternative, in combination with reduced quotas, may exacerbate derby fishing conditions by further dividing an already small quota into smaller portions, thereby increasing the incentive to fish inshore where immature sharks predominate. Additionally, to the extent that this alternative may extend and/or shift traditional shark fishing seasons to other times of the year and other areas, bycatch rates and mortality may also be increased or altered. However, the establishment of ridgeback LCS and non-ridgeback LCS subgroups with separate management measures may essentially establish regional management because ridgeback LCS are predominant in the Atlantic through Florida and non-ridgeback LCS are predominant from Florida through the Gulf of Mexico.

Social and Economic Impacts

This alternative may decrease the predictability and stability of the shark fisheries because of multiple shark fishery openings and closures and greater incentive for fishermen to switch to and from shark fishing and fishing for other species. In addition to the economic costs, this alternative may also disrupt traditional fishing patterns and increase the social impacts of multiple closures, including income and employment stability and predictability. However, depending on how quota overharvests and underharvests were allocated, this alternative would likely satisfy fishermen in those areas or states primarily affected by quota adjustments in the second fishing period.

This alternative could have variable economic impacts depending on the region and/or state quota(s) selected. It may stabilize the market, lengthen the season, and reduce the derby fishery in some areas. In others, it may shorten the season and increase the derby fishery if sufficient quota(s) are not allocated to that region. This alternative would greatly increase enforcement and administrative costs to open, monitor, close, and adjust multiple fisheries.

Conclusion

This alternative is rejected due to increased enforcement and administrative costs and the possibility that derby fishing conditions and associated safety concerns could worsen.

3.4.1.3.6 Public Display and Scientific Quota

In 1997, NMFS prohibited possession of five species of sharks: sand tiger, bigeye sand tiger, whale, basking, and white sharks. These species were identified as highly susceptible to overexploitation and the prohibition on possession was a precautionary measure to ensure that directed fisheries did not develop. Due to their status as a prohibited species, sand tiger sharks (a popular aquarium species) can now only be legally retained by obtaining an exemption from the possession prohibition through the process described under 50 CFR Part 600.745 (Scientific research activity, exempted fishing, and education activity). Such exemptions are called exempted fishing permits, or EFPs. Several LCS are also popular aquarium species, and collectors or aquariums wishing to obtain an LCS during a commercial fishery closure can either obtain an EFP or are limited to the possession limits under the recreational retention limits.

The rationale for issuing an EFP is described in detail under 50 CFR Part 600.745(b) and states: "A NMFS Regional Director or Director may authorize, for limited testing, public display, data collection, exploratory, health and safety, environmental cleanup, and/or hazard removal purposes, the target or incidental harvest of species managed under an FMP or fishery regulations that would otherwise be prohibited." The rationale relevant to this discussion is public display. The process for obtaining an EFP is also described under that section and requires detailed information on the target or incidental species to be harvested, the gear to be used, the locations and times of collection, as well as public notice and comment in the *Federal Register* and notification and consultation with affected Councils and states. Thus, the process for issuance of an EFP under previous regulations was time-consuming and burdensome.

In 1998, NMFS received a total of 14 applications for EFPs to collect Atlantic sharks outside of the current regulations prohibiting possession of sand tiger sharks and possession of LCS during a closure. Twelve EFPs were issued with no modifications (two EFP applications were issued for the 1999 season) which authorized collection of 331 Atlantic sharks. Of those twelve, five EFP applications requested a total of 130 LCS or sand tiger sharks rather than listing the number of sharks per species. The other seven EFP applications listed the number of sharks per species and requested 72 sand tiger, 28 sandbar, eight blacktip, 22 lemon, ten bull, 19 nurse, 14 tiger, 24 scalloped hammerhead, and four great hammerhead sharks, for a total of 201 sharks. The two EFP applications issued for 1999 requested an additional 26 sand tiger, 18 sandbar, 18 dusky, 18 lemon, and 18 bonnethead sharks. By the end of March 1999, NMFS had received 11 EFP applications.

Final Action: **Establish separate public display and scientific research quota of 60 mt ww; Establish separate public display permitting and reporting system**

This action establishes a separate quota, permitting, and reporting system for aquariums, researchers, and collectors of sharks for the purposes of public display and scientific research. Under this system, aquariums and collectors will still apply for a permit and provide essentially the same information as under the previous regulations. NMFS will then evaluate: 1) the status of the stock(s) for the species requested; 2) consistency with conservation, enforcement, and other management objectives; 3) the merits of the application (including the adequacy of the facilities where the animals will be maintained); 4) the aquariums, researchers, or collectors EFP history, if any (number of animals collected previously, gear proposed, whether required reports were submitted in a timely manner, etc); and 5) the amount of public display and scientific quota remaining. NMFS will require applications to specify the number of sharks per species to be collected and will stipulate specific collection limits per species if the EFP is issued.

If deemed appropriate, NMFS will issue a permit with tags (with mail-in information cards) for the collection of a specified number of animals, authorized gears, authorized areas and times for collection activities, and other relevant restrictions. Each permit will be valid only for the number of animals and tags specified, and each animal must be tagged immediately to be considered an authorized collection. Each tag will have an associated information card (species authorized, date, time, and location of collection, sex and size of animal, tag number, etc) that must be filled out and mailed within five days of collection (five days should allow sufficient time to determine an animal's health and suitability for public display). The tag must be maintained in the animal during this acclimation period.

Should an animal be deemed unsuitable for public display during the acclimation period, the animal must be released with the tag intact in a manner that ensures the maximum probability of survival, and the information card should be returned with the word "released" at the top. NMFS may issue a replacement tag and information card for such released animals. This system will preclude the need to public notice and comment in the *Federal Register* and consultation with affected Councils and States in the issuance of each EFP application. Once the public display and scientific quota is reached, no additional EFPs will be issued.

For example, if a collector requested to collect two sand tiger sharks, NMFS would evaluate the request and if appropriate, NMFS would issue an EFP and two tags with information cards for the collection of two sand tiger sharks. In order for the collection activity to be in compliance with the EFP, the applicant must tag the animals immediately and return the information cards within five days of capture. Any shark retained without a tag would be considered a violation of the EFP. If one shark is found to be unsuitable for public display during the first five days of captivity, the animal must be released with the tag intact and the card should be marked "released" at the top. NMFS may then issue a replacement tag and information card under the same guidelines outlined above.

Note: NMFS will consider accreditation in the American Zoo and Aquarium Association, or equivalent standards, as meeting the requirement of providing adequate facilities for animal husbandry (under the merits of the EFP application).

Ecological Impacts

The ecological impacts of this action will be minimal as the public display and scientific quota will be less than five percent of the overall quota established for LCS. To the extent that the permitting and reporting system will better ensure compliance with authorized activities and quota levels, this action will enhance rebuilding.

Social and Economic Impacts

This action will cause a minor reduction in total quota levels and potential commercial revenues as the separate public display and scientific quota will be deducted from the LCS quota. However, it is unlikely this will impact fishermen significantly. This action should reduce the time delays currently associated with collecting sharks for public display and will facilitate advanced planning of fishing activities. This action does not have significant safety at sea concerns.

This action will greatly enhance monitoring and enforcement of authorized activities and quota levels. Currently, dockside enforcement mechanisms are greatly reduced due to lack of a verifiable permitting, monitoring, and reporting system. This action will maintain moderate administrative costs relative to the number of participants and the quantity of shark collections involved. This action has received Paperwork Reduction Act approval.

Conclusion

This action is selected due to the increased monitoring and enforcement associated with a separate permitting and reporting system, which will enhance LCS rebuilding by increased tracking of all sources of mortality and reduced opportunities for unauthorized collections.

Rejected Options for Public Display and Scientific Quota

Rejected Option: Status quo (exempted fishing permit process under 600.745 regulations)

This alternative would maintain the rationale and process under 600.745 regulations for exemptions from the prohibitions on possession of sand tiger sharks as well as an exemption from the prohibition on possession of other sharks over the recreational retention limit during a commercial fishery closure.

Ecological Impacts

This alternative would have no new ecological impacts. However, indirect impacts of the current rationale and process for EFPs, which can result in reduced enforcement and compliance, could negatively impact LCS rebuilding.

Social and Economic Impacts

This alternative results in extended delays of EFP issuance to aquariums and collectors of sharks for public display and hinders advanced planning of fishing activities. This alternative is not expected to have social impacts or safety at sea implications. This alternative imposes a moderate administrative costs (preparing numerous notices of receipt of EFP applications in the *Federal Register*, establishing comment periods, consulting with States and Councils, and issuing EFPs) relative to the number of participants and the quantity of shark collections involved.

Conclusion

This alternative is rejected because of the extended delays and administrative costs in EFP issuance.

3.4.2 Effort Controls, Retention Limits, and Other Management Measures

Given the fully-fished and overfished status of many HMS stocks, management of recreational fishing effort is an important component in building and maintaining sustainable HMS fisheries. Fishing effort can be limited in several ways, for instance through seasonal closures, catch and release requirements, or retention limits. Retention limits place a limit on the number of fish that an angler or vessel may retain on the basis of fishing trip, day, season, or some other measure of effort. NMFS implements these measures as necessary and retention limits are included on the framework (refer to Section 3.10.) Some effort controls and retention limits may have positive impacts on safety at sea due their effects on reducing the length of a trip (except in the case of recreational fishing, in which fishermen can continue to catch and release). Other retention limits may negatively effect safety at sea if they cause fishermen to take multiple "trips" in a day in order to maximize their catch. The following sections address the use of retention limits and other management measures in HMS fisheries.

3.4.2.1 Atlantic Tunas

3.4.2.1.1 Bluefin Tuna Effort Controls

General Category

Effort controls are used in the bluefin tuna fishery to affect where, when, and how (gear type) bluefin tuna are harvested for a variety of objectives. General and Angling category catch per unit effort information is used in stock assessments, and lengthening the season is important for the collection of these data used to monitor the status of the stock. See Section 3.4.1.1.2 for a more detailed explanation of catch per unit effort and the importance of scientific data collection in the west

Atlantic bluefin tuna fishery. Objectives also include reducing bycatch, achieving optimum yield (e.g., lengthening the season for market reasons), and addressing allocation issues (e.g., through set-asides and split seasons). For example, the temporal and spatial effort control alternatives for the General category seek to lengthen the fishing season in a category with high participation and catch rates.

Prior to this FMP, which includes a limited access system for Atlantic tunas Longline category participants, all but one of the commercial and recreational Atlantic tuna permit categories were open access. The Purse Seine category was the single "closed" U.S. bluefin tuna fishery, operating under a limited access, transferable individual vessel quota (IVQ) system. While the other categories (General, Harpoon, and Angling, and Trap) are open access, NMFS has published a "control date" (September 1, 1994) in the *Federal Register*. The purpose of this control date is to advise current and future commercial participants that access to the U.S. bluefin tuna fishery may be limited at some point in the future, and that future access for entrants after the control date is not assured. NMFS has also published a concept paper on limited access for Atlantic HMS, and has held public workshops on limited access in the Atlantic tunas fisheries. The 1995 bluefin tuna Final EIS also discusses several "strawman" proposals for limited access and IVQs. NMFS plans to consider some form of limited access in the bluefin tuna fishery, as other fisheries undergo limited access, restrictions on fishing effort to support rebuilding, and a narrowing of other alternatives available to new fishery participants. The effort controls discussed below should be considered in light of both open and limited access.

Currently, NMFS establishes annual General category effort control specifications, including time period subquotas and restricted-fishing days (RFDs) on which fishing for bluefin tuna by vessels in the General category is prohibited. Effort controls are implemented to extend the fishing season temporally and spatially, in order to collect better scientific data for stock assessment purposes, and to increase ex-vessel prices as fish quality improves in the fall, thereby helping to achieve optimum yield). NMFS intends to continue with this method of annual specifications to establish time period subquotas and RFDs. Input from the public, industry, NMFS' consultative parties, and the HMS AP is incorporated into the annual effort control specifications for the General category.

Along with the Addendum to the draft HMS FMP, NMFS published proposed annual General category effort control specifications for the 1999 fishing year. The General category effort control alternatives are discussed in Appendix 3; final specifications will be published along with the 1999 Atlantic bluefin tuna quota specifications separately from the final rule to implement the HMS FMP and Amendment 1 to the Billfish FMP.

Spotter Aircraft

Spotter aircraft are used in the commercial fisheries for bluefin tuna. Aircraft are utilized by vessels fishing in the General, Harpoon, and Purse Seine categories to locate schools of fish and assist the vessels in the capture of the fish, by providing information on where to set nets, throw harpoons, and put out or troll lines. NMFS has received numerous comments that the use of aircraft to locate bluefin tuna is, among other things, undermining the General category effort controls previously established for the General category and is accelerating the closure of both the General and Harpoon categories. The resulting increase in efficiency of the few vessels that use spotter planes has the effect of undermining NMFS' efforts to meet optimum yield, as fishing opportunities are further restricted by the accelerated use of quota. Furthermore, the specific data collection programs for catch per unit effort would be jeopardized, in part by the added influence of spotter planes.

NMFS has, on two occasions prior to the draft FMP and Addendum, requested specific comments on ways to mitigate the impact of aircraft use on catch rates (54 FR 29916, July 17, 1989 and 61 FR 18366, April 25, 1996). Prior to 1997, NMFS elected not to regulate aircraft use in the Atlantic tuna fisheries, in part because of concerns about the enforceability of spotter aircraft regulations. Additionally, in 1996, the majority of active tuna spotters signed a voluntary agreement that would limit activity to harpoon vessels. NMFS recognized that the voluntary agreement warranted a trial period, but also indicated that the agency would continue to monitor the situation and would take appropriate action if necessary.

On March 4, 1997 (62 FR 9726), NMFS proposed to prohibit use of aircraft and again requested comments. On July 18, 1997 (62 FR 38487), NMFS published a final rule prohibiting the use of aircraft to assist vessels in all but the Purse Seine and Harpoon categories. In response to a lawsuit filed by the Atlantic Fish Spotters Association, the United States District Court for Massachusetts, on June 10, 1998, ordered that the prohibition on the use of spotter aircraft in assisting bluefin tuna vessels in other than the Harpoon and Purse Seine categories, as codified in 50 CFR 285.31(a)(40) be overturned, and is now void.

However, fishery management concerns regarding optimum yield and data collection continue to be expressed. Public comments continue to vociferously urge that NMFS ban planes in the bluefin tuna fishery (except for use in the Purse Seine fishery) for a multitude of reasons. Finally, at the August 1998 meeting of the HMS AP, apart from three abstentions, all members of the AP requested and advised that NMFS prohibit the use of spotter planes in the bluefin tuna fishery. Therefore, NMFS is again considering action to respond to these issues. The following section describes several alternatives that NMFS is considering in order to better understand and manage the effects of spotter aircraft in the bluefin tuna fishery.

Final Actions on Effort Controls

Final Action: No action at this time on spotter planes (status quo)

This action maintains the status quo, which is that there are no restrictions on spotter aircraft assisting fishing vessel operators to locate and catch bluefin tuna.

As mentioned above, the HMS AP considered this issue at a public meeting in August 1998. While the vast majority of the public comments opposed the use of aircraft in the General and Harpoon categories (see following alternative), some did speak in favor of their use. The reasons they gave for allowing the use of spotter aircraft in all categories included: spotter planes do not significantly accelerate the catch rate - it is the sheer number of participants in the fishery that accelerate the catch rate; spotter aircraft and pilots have contributed to science through the aerial survey; and spotter pilots allow vessels to select for larger fish via sighting of relative size between schools of fish, resulting in fewer discards. Those defending the use of spotter aircraft also expressed concern that this issue was being decided by a popularity contest and that just because the majority wants aircraft banned does not mean it is a legally defensible action.

The AP itself discussed the issue extensively, and while the AP did not express a unanimous view, a strong consensus emerged in favor of prohibiting the use of airplanes by all vessels participating the Atlantic tunas fisheries, with the exception of Purse Seine category vessels. Several AP members reserved comment, but none spoke in favor of plane use. The points that the AP members made in favor of banning the use of aircraft are described in the alternatives to prohibit the use of spotter aircraft.

Ecological Impacts

As mentioned above and described here and in the following alternatives, maintaining the current regulations could result in continued difficulties with premature fishery closures and market gluts, and could counteract the General category effort controls. The ecological impacts of spotter planes in the bluefin tuna fishery are likely minimal, although some commenters indicated that the use of spotter planes results in discards in that harpooners not relying on aircraft may be more selective. Several comments also indicated that planes make it easier to land multiple fish in a day, and may result in some vessels illegally high-grading in the General category (in which vessels are only allowed one fish per day, and are required to stop fishing and return to port as soon as the one fish is caught).

Social and Economic Impacts

Allowing the use of spotter aircraft permits spotter pilots to continue to generate income from the bluefin tuna fishery, although this income comes directly from the sale of the fish, which would otherwise remain with the vessel. There is no change in total gross revenues from the General category quota (unless accelerated catch rates result in lower prices), just a reallocation of some revenues to pilots rather than vessels.

Safety-at-sea concerns have also been identified by the public, and would not be addressed by continuing to allow the use of spotter planes. Many harpoon fishermen argue that the use of spotter planes is contradictory to the reasoning used in establishing the Harpoon category (i.e., that a harpoon fishery can only be pursued under optimal weather and sea conditions, which is why it was given a multiple daily catch allowance). Additional impacts of the use of spotter aircraft in the bluefin tuna fishery are described in the other alternatives below.

Conclusion

As evidenced by the AP's consensus, NMFS maintains that the use of spotter planes in the General and Harpoon categories is a problem in the bluefin tuna fishery and that the use of spotter planes impedes the collection of important scientific information about this fishery. NMFS maintains that this remains true, even though the west Atlantic bluefin tuna fishery is no longer a "scientific monitoring" quota under the 1998 ICCAT Recommendation on west Atlantic bluefin tuna rebuilding. While no longer a "scientific monitoring quota," the Recommendation does require that the United States provide the best available data for the assessment of the stock by SCRS.   In addition, NMFS now needs to ensure that the use of spotter planes is consistent with NMFS' efforts to implement measures to achieve optimum yield in the bluefin tuna fishery, consistent with the Magnuson-Stevens Act. For these reasons, NMFS is currently developing a proposed rule to address the issue of spotter planes in the bluefin tuna fishery, and intends that a final rule would be completed prior to the commencement of the General and Harpoon category fishing seasons, June 1, 1999. NMFS will consider information gathered during the development of this FMP, including comments from AP members and the public during the scoping and other public comment processes. These comments were very helpful and NMFS has determined that it will address this issue in a separate rulemaking.

Final Action: Establish a "school reserve" category

This action establishes a "school reserve" category which could be used in the instance of overharvest in the school category. This action would be implemented with any rebuilding and allocation alternative, so long as the allocation alternative provides for a school bluefin tuna fishery.

For school bluefin tuna, ICCAT limits west Atlantic bluefin tuna fishing nations to eight percent of their national quota (see discussion below and in the rebuilding sections of the FMP). For the preferred rebuilding and allocation alternatives, this would be 111 mt ww for the United States. Because of high, as well as highly variable, catch rates, the Angling category can easily harvest and exceed this quota. The United States is held accountable for such an overharvest, and those school fish would be deducted from the U.S. quota in the following year.

The 1998 ICCAT Recommendation on west Atlantic bluefin tuna rebuilding requires that the catch of school bluefin tuna be limited to no more than eight percent by weight of the total U.S. quota over each four-consecutive-year period. NMFS proposes to implement this provision through the establishment of the school bluefin tuna reserve specified below and through annual adjustments to the school bluefin tuna landings and reserve categories as necessary to meet the ICCAT requirement. Given the four-year accounting period, NMFS adjustments for estimated overharvest or underharvest of school bluefin tuna will not be restricted to automatic carryover between fishing years. Instead, flexible adjustments would be made to enhance fishing opportunities and the collection of information on a broad range of bluefin tuna size classes, provided that the eight percent landings limit is met over the applicable four-year period.

A school reserve of approximately 20 mt ww [actual tonnage would be calculated from a percentage (18.5 percent of school allowance, which would be 21 mt ww), as with other allocations] will reduce the chances of the United States exceeding the eight percent tolerance, as the school reserve will not be allocated at the start of the season, but would be held in reserve as a buffer against an overharvest. If an overharvest did not occur, the school reserve could be allocated to the recreational fishery later in the year or carried over and allocated the following year, consistent with the relevant ICCAT recommendations.

Ecological Impacts

This action could have positive ecological impact as it could help prevent the United States from exceeding its quota of school bluefin tuna.

Social and Economic Impacts

As this action will not increase or decrease the overall quota or the Angling category quota, it would not have any social or economic impacts as compared to the status quo. The Angling category will still be allowed to harvest its full quota.

Conclusion

This is the final action. Along with the 1998 ICCAT recommendation which allows four years to balance the eight percent tolerance, establishing a reserve of school bluefin tuna will provide more flexibility in managing the Angling category fishery. This could help prevent the United States from exceeding its quota of school bluefin tuna, which would prevent excessive fishing on the stock as well as reductions in future years' school bluefin tuna quota. This alternative would not have negative social or economic impacts. NMFS has not identified any safety-at-sea implications for this action.

Rejected Options for Effort Controls

Rejected Option: For all vessels other than purse seine category vessels, prohibit the use of aircraft to assist fishing vessel operators in the location and capture of west Atlantic bluefin tuna

As mentioned above, NMFS has received numerous comments that the use of aircraft to locate bluefin tuna for General category vessels is contrary to effort controls previously established, accelerates the closure of the Harpoon category, and poses safety concerns. This alternative would prohibit the use of aircraft for bluefin tuna fishing except for assisting Purse Seine category vessels.

The Harpoon boat category was established in 1980 based on information supplied by a small number of harpoon fishermen. They presented evidence that they constituted a small traditional fishery that should be segregated from the General category. The harpoon fishery could only be pursued under optimal weather and sea conditions, which allow fishermen to sight fish from the tower and pulpit. Since these conditions occur infrequently in New England, the one fish per day per vessel General category catch limit was too restrictive and hence, a separate quota and a multiple daily catch allowance was established for the Harpoon boat category. However, the use of harpoons in the General category is also authorized, and the proportion of fish landed in the General category with harpoon gear has increased steadily since 1994.

NMFS has received comments that the use of spotter aircraft undermines the basis for the multiple daily catch allowance which was once considered necessary for the preservation of the traditional harpoon fishery. Commenters note that, with the advent of spotter planes, harpooning can be done under far less than optimal weather and sea conditions, and Harpoon category participants are able to fill category quota more quickly. Some Harpoon vessel owners apparently switch to General category vessels when the Harpoon category quota is attained and continue to use their spotter planes, thus accelerating the rate at which the General category quota (or time period subquota) is met, and counteracting the effort controls designed to extend fishing opportunities for the General category.

Commenters have noted that maintaining the current regulations could result in continued difficulties with premature fishery closures and market gluts and could counteract the General category effort controls. They note that the use of planes, among other factors, undermines the General category effort controls. Similarly, banning spotter aircraft for all but the Purse Seine category fishery is consistent with other measures used by NMFS in recent years to ensure a wider geographical and temporal distribution of fishing activities, which contributes to the collection of the best scientific data for stock assessment purposes, and provides or increases fishing opportunities for all fishery participants (consistent with NMFS' efforts to achieve optimum yield in this fishery). In recent years, the General category quota has been met in less time than previously, despite other efforts to slow the fishery (via time period subquotas and restricted-fishing days). NMFS notes that use of aircraft to harvest more fish in a shorter period of time is inconsistent with measures to slow the fishery and improve market conditions, particularly for a fresh fish fishery. In 1996, ICCAT adopted a recommendation prohibiting the use of spotter aircraft by purse seine vessels in the Mediterranean due to their effect of accelerating catch rates. However, in the United States, the Purse Seine category fishery is managed under a transferable individual vessel quota program. Therefore, the rate of catch in the U.S. Purse Seine category fishery is not of concern. Spotter planes can assist Purse category vessel operators in the location of schools of large fish, thus reducing discards.

Enforcement is a central issue in the regulation of the use of aircraft for the bluefin tuna fishery. Certain industry members have indicated that they are willing to work with NMFS Enforcement by providing information regarding potential violations of spotter plane regulations. Special agents with investigative training could be deployed to follow up on potential violations. In comments on the 1997 spotter plane prohibition rulemaking, the Federal Aviation Administration (FAA) indicated that the ban would not interfere with the FAA's jurisdiction, because the rule would not prevent or hinder pilots from flying since the action only would prohibit vessels from using any aircraft to aid in the harvest of bluefin tuna.

As mentioned above, the HMS AP considered this issue at a meeting in Warwick, RI in August 1998. The meeting was open to the public and during the public comment period the AP heard extensive testimony from fishery participants both in favor of and against this alternative. The majority of the public comments were against the use of aircraft in the General and Harpoon categories. Commenters expressed the following reasons for banning the use of spotter aircraft: spotter planes accelerate the catch rate in both the General and Harpoon categories, both directly and indirectly; accelerated catch rates result in shorter seasons, thereby affecting both catch per unit effort data collection and revenues; planes make it easier to catch multiple fish and thus make it easier to violate catch limit regulations and highgrade; vessels operating with the assistance of planes often cause conflict on the fishing grounds; airplanes are not a traditional or historical part of the Harpoon or General categories - they only got involved extensively after there was less work spotting for swordfish in the mid-1980s; and planes can cause safety concerns, for both vessels and the planes themselves, by concentrating vessels and planes in a small area. The AP itself discussed the issue extensively, and while the AP did not express a unanimous view, a strong consensus emerged in favor of banning the use of airplanes by all vessels participating the Atlantic tunas fisheries, with the exception of Purse Seine category vessels. Several AP members reserved comment, but none spoke out in favor of plane use. The points that the AP members made in favor of banning the use of aircraft in all but the Purse Seine category were as follows (these comments are noted as stated):

- The use of spotter aircraft accelerates the catch rate in both the General and Harpoon categories, both directly and indirectly. They are a highly efficient, unregulated, unpermitted, gear type. Vessels that hire planes directly are obviously assisted, but many vessels are assisted indirectly just by seeing the planes and using them as a guide to where the fish are. This indirect or "peripheral" catch may be hard to quantify, but it exists and is significant; it also undermines NMFS' efforts to achieve optimum yield in this fishery. In addition, most fish in the Harpoon category are caught with the assistance of planes. With no planes, the Harpoon category would last much longer, and the Harpoon category fishermen would not switch over to a General category boat (to further accelerate the catch in the General category) as soon.

- Because the use of spotter aircraft accelerates the catch rate, their use compromises the collection of good catch per unit effort data, which are then used in the stock assessments. Aircraft cause the catch to be spatially and temporally concentrated, less random in nature, and more affected by short term and localized factors which can result in unreliable or unusable catch per unit effort data for stock assessments.

- Planes cause an increase in effort. When fish are hard to find or are far offshore during parts of the season, planes can find them very easily. Vessels that normally would not even try in such conditions are then directed to these fish by the planes.

  The use of spotter planes adds to a vessel's potential to violate regulations and land multiple fish per day in the General category, to highgrade and discard low quality fish.

  Pilots do not have a vested interest in the fishery. They are essentially an unpermitted gear type, and their activity is not monitored or controlled.

  The use of spotter aircraft is a safety concern. The "rules of the road" for navigation and safety do not seem to apply when vessels are racing after a plane.

Ecological Impacts

This alternative probably would have minimal impact on stock rebuilding as whatever quota is in place would most likely be harvested with or without the use of spotter aircraft. However, spreading the General category fishery out, both temporally and geographically, would result in better data being collected and used in stock assessments, which would have positive ecological affects as there would be a better understanding of the status of the stock and more informed management decisions could be made. As for discards, it is unclear what effect prohibiting the use of aircraft would have on the catch of bluefin tuna too small to retain. Some comments indicate that discards would be reduced because harpooners not relying on aircraft may be more selective. However, some commenters argue that the discards may be increased because harpooners are not as accurate in finding retainable fish as are spotter pilots. There is little reliable information currently available to determine which outcome is more likely to occur.

Social and Economic Impacts

Spotter aircraft have largely been employed in the Purse Seine and Harpoon categories, and to a much lesser extent in the General and Angling categories.

Anecdotal evidence to date suggests that each spotter pilot assists in the harvest of 15 Harpoon Category fish per season and that spotter pilots receive 25 percent of a vessel's revenues from sale of bluefin tuna. Using 1997 figures (average weight of Harpoon category landings and average price per pound), prohibiting the use of spotter aircraft in the Harpoon category would thus reduce average gross revenues for pilots by approximately $12,000. However, in the General category, daily landings are limited to one bluefin tuna per vessel. Therefore, prohibiting the use of spotter pilots in the General category would be expected to reduce average gross revenues for pilots by considerably less than $12,000.

Because the full bluefin tuna quota would likely be taken even without the aid of spotter aircraft, gross revenue lost to pilots would accrue to vessel operators. No information available to NMFS suggests that the pilots depend solely on bluefin tuna spotting for their livelihoods. This alternative may not have a significant economic impact, if one views the fishery in the context of several thousand small business entities, including vessel operators and shoreside support services. The 1995 Final Environmental Impact Statement for bluefin tuna provides information on direct and indirect full-time equivalent (FTE) employment in certain portions of the bluefin tuna fishery. An estimated total of over 1,200 direct and indirect FTE jobs are attributed to the bluefin tuna fishery. On a full-time equivalent basis, less than two percent of small business entities would be affected by this alternative (Final Environmental Impact Statement, July 20, 1995, p. 129, Table 3.16).

Anecdotal information suggests the existence of some unsafe practices by spotter planes, such as near misses with more than one aircraft flying at low altitude or aircraft attracting too many vessels to the same area. For example, on April 9, 1997, two single-engine planes carrying spotters of spawning herring collided over Prince William Sound, AK, killing two individuals in one of the planes.

Conclusion

This alternative is rejected at this time. NMFS believes more information on the use and effects of spotter aircraft in the bluefin tuna fisheries should be reviewed before taking further action. NMFS will continue to seek the input of the HMS AP in further evaluation of management alternatives regarding spotter aircraft. See conclusion for the final action.

Rejected Option: For all vessels other than harpoon and purse seine category vessels, prohibit the use of aircraft to assist fishing vessel operators in the location and capture of west Atlantic bluefin tuna

NMFS implemented this measure though a final rule effective July 1997. However, as mentioned previously, the United States District Court for Massachusetts ordered that the prohibition be overturned effective June 10, 1998.

Despite the Court's ruling, NMFS continues to believe that extending the season for the rod-and-reel fisheries helps ensure the collection of the best available data for the assessment of the stock as well as providing opportunities for all fishery participants. To this end, NMFS has taken regulatory actions in previous years to extend the bluefin tuna season for the General and Angling categories. However, data from the Harpoon and Purse Seine category fisheries have not been incorporated into any of the currently usable catch per unit effort indices; therefore the effect of spotter aircraft accelerating catch rates in these fisheries is less significant.

While exempting Harpoon as well as Purse Seine category vessels would mitigate adverse impacts on spotter pilots, there would be difficulties in enforcing the ban when the Harpoon and General category fisheries are operating concurrently. Harpoon gear is also authorized for the General category, but the exemption would only apply to vessels permitted in the Harpoon category.

Ecological Impacts

This alternative would have effects that are primarily economic and/or administrative in nature. However, as spotter pilots are able to determine the approximate size class of a school of bluefin tuna, prohibiting the use of spotter aircraft in the General category may increase the potential for catching undersized fish in the handgear categories and could lead to increased discards. It is unclear what effect prohibiting the use of aircraft would have on the catch of bluefin tuna too small to retain. Some comments indicate that discards would be reduced because harpooners not relying on aircraft may be more selective and because they will be less apt to strike at fish they cannot see well (as they may with spotter pilot assistance). However, some commenters argue that the discards may be increased because harpooners are not as accurate in finding retainable fish as are spotter pilots. There is little reliable information currently available to determine which outcome is more likely to occur. In recent years, less than ten percent of the General category quota has been taken with harpoon gear, thus the potential for increased (or decreased) discards is limited.

Social and Economic Impacts

The analysis in the final action and in the previous rejected alternative includes a description of the potential social and economic impacts of this alternative. As mentioned above, exempting harpoon as well as purse seine vessels from a spotter aircraft prohibition would mitigate adverse impacts on spotter pilots.

Conclusion

This alternative is rejected at this time. NMFS believes more information on the use and effects of spotter aircraft in the bluefin tuna fisheries should be reviewed before taking further action. NMFS will continue to seek the input of the HMS AP in further evaluation of management alternatives regarding spotter aircraft. See conclusion for the final action.

Rejected Option: Reintegrate the Harpoon and General categories

Reintegration of the Harpoon category with the General category would simplify regulations and establish parity between the two categories insofar as the catch limit would be one bluefin tuna greater than 73 inches CFL (or 81 inches CFL, if implemented) per vessel per day for all handgear types. It has been alleged that fishing activities associated with spotter aircraft require that multiple landings be attempted, potentially through the practice of at-sea transfers. The reduction in the daily catch limit for the harpoon sector would diminish the cost-effectiveness of spotter aircraft assistance and thus could potentially reduce their use in the fishery.

Ecological Impacts

This alternative would have effects that are primarily economic and/or administrative in nature.

Social and Economic Impacts

The social and economic impacts from this alternative would mostly be felt by the participants in the Harpoon category who would be limited to the one fish per trip retention limit in the General category. Some vessels in the Harpoon category land over 25 fish per year. The more successful vessels in the General category land similar numbers of fish, so the impact may not be great, although because of the General category daily catch limit of one fish per vessel, more trips are necessary. Many vessel owners in the Harpoon category also own another vessel in the General category, and when the Harpoon category closes, they fish in the General category on their second vessel. This alternative would eliminate the need for a second vessel, and could impact the revenues of those owners/operators who have multiple vessels. This is hard to assess, however, as these vessel owner/operators could participate full-time in the General category and potentially make up for the income lost from the Harpoon category vessel.

Conclusion

This alternative is rejected at this time. For those who use exclusively harpoon gear, the weather dependency of using harpoon gear still warrants the multiple catch limit in the Harpoon category. NMFS will continue to seek the input of the HMS AP in further evaluation of management alternatives regarding spotter aircraft. See conclusion for the final action.

3.4.2.1.2 Bluefin Tuna Recreational Retention Limits

Final Action: Status quo retention limits

This is the status quo alternative for the bluefin tuna Angling category. Inseason adjustments are based on catch levels and considerations of effort over time and area. While this FMP implements a base Angling category daily retention limit of one bluefin (measuring 27 to less than 73 inches CFL) per vessel, this management measure relies on inseason adjustments to regulate the daily retention limits for the Angling category. Anglers are advised to check the updates (e.g., catch limit adjustment and closure information) that NMFS provides via the Atlantic Tunas Information Line (888-872-8862) or www.usatuna.com before making a fishing trip. Recreational anglers are also allowed one “trophy” fish per vessel per year of 73 inches CFL or greater which cannot be sold. NMFS intends to maintain this system because the limited recreational quota, and highly variable catch rates and locations, make it difficult to set fixed retention limits. NMFS continues to work with recreational fishermen and the HMS AP to develop an improved system to manage inseason retention limits for the bluefin tuna Angling category fishery, particularly in light of the ICCAT-recommended four-year balancing period for the eight percent tolerance of school bluefin tuna landings.

Rejected Options for Bluefin Tuna Recreational Retention Limits

Rejected Option: Adopt a sliding scale daily retention limit for bluefin for U.S. Coast Guard inspected vessels

This alternative would add to the status quo a sliding scale daily retention limit for Coast Guard inspected vessels with Charter/Headboat category permits. NMFS has received a proposal from several recreational fishing groups to set a higher retention limit for Coast Guard inspected vessels. These vessels carry a larger number of passengers for-hire than do non-inspected vessels. The proposal requested a daily retention limit of one fish per angler, with the following graduated scale for the maximum number of fish per vessel:

six fish for vessels that carry eight to 20 passengers

eight fish for vessels that carry 20 to 25 passengers

ten fish for vessels that carry 35 to 48 passengers

12 fish for vessels that carry 40 to 60 passengers

14 fish for vessels that carry 60 to 80 passengers

18 fish for vessels that carry 80 to 100 passengers

20 fish for vessels that carry 100 to 149 passengers

These increased daily retention limits would only apply when the Angling category fishery is "open" (daily retention limit is higher than one fish from the school through small medium size classes - e.g., one school bluefin tuna per person, with up to three school bluefin tuna per vessel).

Ecological Impacts

There would be little ecological impact with this alternative as compared to the status quo. The number of fish caught in the Angling category is controlled through a quota, which would not be affected by a sliding scale daily retention for inspected vessels. However, the retained catch would likely be more concentrated in certain times and areas and the quality of the catch per unit data would be affected.

Social and Economic Impacts

Several HMS AP members who represent the recreational fishing community, especially those representing charter and headboat fishermen and associations, have expressed concerns that recent restrictions on Angling category daily retention limits have unfairly excluded larger charter and headboats from the bluefin tuna fishery. This sliding scale daily retention limit could allow those vessels to participate in the bluefin tuna fishery. Several other AP members thought that a different retention limit for inspected vessels would be unfair to the smaller "six-pack" charterboats and private recreational vessels. It would likely result in a shorter season for all bluefin tuna recreational fishery participants, especially those in areas where bluefin do not appear until later in the season.

Conclusion

While this alternative may be viable, it is rejected at this time. Retention limits in the Angling category have varied widely over the course of the last few years. It is difficult to predict catch rates and landings, and a sliding scale retention limit for inspected vessels would be difficult and confusing to implement for the highly dynamic Angling category. As mentioned above, however, NMFS is committed to working with recreational fishermen and the HMS AP to develop an improved system to manage inseason retention limits for the bluefin tuna Angling category fishery.

3.4.2.1.3 Bluefin Tuna Size Limits

Minimum size limits can influence the size composition of the harvest, and will influence the amount and character of total fishing mortality in a fishery and the therefore pace of rebuilding. Under minimum size regulations, fishermen may not retain and/or land fish below the minimum size. Minimum size regulations are intended to conserve juvenile fish in three ways. First, prohibition on landing and/or sale prevents development of a commercial market for small fish, thereby discouraging fishermen from targeting them. Secondly, some of the small fish that are discarded will survive and mature to reproduce and contribute to the stock biomass. Third, a minimum size results in fewer fish being retained per mt than would be otherwise. However, to the extent that fishermen cannot control the size composition of the fish they catch, minimum sizes can result in significant discards of undersized fish. The objective to minimize bycatch and bycatch mortality, and the requirement to rebuild overfished fisheries should be considered when evaluating these alternatives.

Many of these alternatives, while listed separately here, could be implemented simultaneously. For example, an increase in the minimum size for recreational bluefin tuna could be implemented at the same time as an increase in the minimum size for sale. Each minimum size alternative is analyzed individually, but more than one combination of alternatives is possible, and the alternatives should be considered in the context of other management measures under consideration in rebuilding overfished stocks, such as quota reductions, and retention limits. Also, in many cases, quantitative data are not available to assess the impact of these alternatives on the shape and slope of the rebuilding trajectory. In those cases, the effects on rebuilding are evaluated in a qualitative manner. There are no significant safety implications of these bluefin tuna retention limit alternatives.

Final Action: Status quo minimum size for bluefin tuna

The current minimum size for bluefin tuna is 27 inches curved fork length (CFL) recreational and 73 inches CFL commercial. ICCAT recommends that there be no economic gain from the take of bluefin tuna measuring less than 45 inches and there is an eight-percent tolerance for these fish. NMFS has taken an even more restrictive approach in implementing the no economic gain provision by prohibiting the sale of bluefin tuna measuring less than 73 inches CFL. U.S. regulations allow zero tolerance of landings of bluefin tuna measuring less than 27 inches. Purse Seine category vessels are restricted to giant bluefin tuna ($\geq$ 81 inches CFL), but are allowed a tolerance for large medium bluefin tuna (73 to 81 inches CFL) of 15 percent by weight of the total amount of bluefin tuna per trip, and ten percent by weight of the total amount of bluefin tuna per season per vessel. For the Harpoon boat category, although landings of giant bluefin tuna are not restricted, there is a daily limit of one large medium bluefin tuna per vessel.

Ecological Impacts

As this is the status quo, the effects of this action will be determined by the overall quota levels and allocation actions described above. For a complete description of the impacts of the status quo, see the description of fisheries section (Chapter 2), as well as the final rebuilding and allocation actions in this chapter.

Social and Economic Impacts

For a complete description of the impacts of the status quo, see the description of fisheries section (Chapter 2), as well as the final rebuilding and allocation actions in this chapter.

Conclusion

This is the final action. NMFS maintains that the current size limits and tolerances for the bluefin tuna fishery are consistent with ICCAT recommendations, the objectives of this FMP, and achieving optimum yield in the fishery. The current size limits and tolerances for bluefin tuna limit fishing mortality on pre-spawning fish, minimize bycatch and discards, maximize fishing opportunities, and will allow the stock to rebuild.

Rejected Options for Bluefin Tuna Size Limits

Rejected Option: Increase minimum recreational size for bluefin tuna to 47 inches (119 cm) CFL (large school size class)

This alternative would eliminate the fishery for school bluefin tuna which targets fish 27 inches to less than 47 inches CFL. The 1996 ICCAT recommendation on bluefin tuna prohibited the landing of school bluefin tuna, with a discretionary tolerance of eight percent, by weight, of a country's national quota. The 1998 recommendation allows four years to balance the eight-percent tolerance for school bluefin tuna. The new recommendation would allow the United States to not allow the catch of school bluefin tuna for two or three years, "storing up" its school bluefin tuna allowance which could then be allocated in one year. The United States currently allows the eight-percent to be landed under the Angling category quota on an annual basis. This alternative would eliminate that eight-percent tolerance, and would allocate the quota to the large school/small medium size classes for the recreational Angling category.

Ecological Impacts

Under this alternative, no school bluefin tuna would be landed. Using average weights and the preferred rebuilding and allocation alternatives, the number of bluefin tuna landed in the United States would be 11,103 (5,836 ≥ 73 inches CFL and 5,267 < 73 inches CFL) per year, a reduction of 30 percent from what would be landed under the status quo.

SCRS and the Southeast Fisheries Science Center did not analyze or project the effects of eliminating the school fishery using the 1998 stock assessment, but the Southeast Fisheries Science Center has projected bluefin tuna stock status into the future under a scenario eliminating the school fishery using data from the 1996 assessment. The projections indicated that eliminating mortality in the school fish fishery would result in slightly faster rebuilding under all rebuilding (quota) scenarios. Because regulations have limited the share of school bluefin tuna catch in recent years (since 1994) to a relatively small share of the overall west Atlantic catch, current catch levels have little effect on west Atlantic stock rebuilding projections. Under a 20-year rebuilding program (500 mt ww/year west Atlantic quota using the 1996 assessment), the stock would rebuild in only slightly less time (perhaps one year) than under the status quo allocation alternative. In addition, if rebuilding were to be set to a time period (as it is in the rebuilding alternatives in this FMP Addendum), eliminating the school fish fishery would allow a slightly greater quota to be landed during rebuilding, while at the same time keeping the stock on the selected recovery trajectory. However, increasing the minimum size to 47 inches would virtually eliminate collection of any scientific data, especially catch per unit effort data, on school bluefin tuna.

The elimination of the school fish fishery for bluefin tuna could have a negative impact on other fish stocks, particularly for other fully- or over-fished HMS such as yellowfin tuna and sharks, should the displaced recreational effort shift to target those stocks. This alternative could also increase discards of school bluefin tuna, as recreational fishermen may not be able to control the size composition of the bluefin tuna they catch.

Social and Economic Impacts

This alternative would not reduce the quota for any category in the bluefin tuna fishery, but would eliminate the fishery for school bluefin tuna. In certain areas, such as off Ocean City, MD; Wachapreague, VA; and Cape May, NJ, the primary recreational and charter fishery for bluefin tuna targets school bluefin. These fleets and communities may be adversely affected by this alternative as they may not be able to shift effort towards large school/small medium bluefin tuna, or other species. Angler consumer surplus would most likely be reduced from status quo levels (see rebuilding alternatives and economic description of fisheries section). Current catch limits for school bluefin tuna are already considered very restrictive by recreational constituents.

Conclusion

This alternative is rejected because projections indicate that eliminating the school fish fishery would result in only slightly faster rebuilding under all rebuilding (quota) scenarios, and eliminating the school fishery would have too great a negative impact on the recreational fishery and its communities. NS 8 requires NMFS to minimize adverse economic impacts on fishing communities, to the extent practicable. There are other practicable measures that can be taken that would result in less severe economic impact to recreational bluefin tuna fishing communities and businesses without unduly compromising rebuilding requirements (e.g., the eight-percent tolerance on the landing of school bluefin). In addition, this alternative would restrict NMFS' ability to collect scientific information (both catch and effort data and biological samples) from the school bluefin tuna fishery, which would be contrary to the 1998 ICCAT recommendation to collect the best available data for the assessment of the stock by SCRS, including information on the catches of the broadest range of age classes possible. The U.S. rod and reel small fish catch per unit effort (CPUE) index is especially important for stock assessment purposes, as it provides insight on the future condition of the spawning stock and is the only small fish rod and reel index available for the west Atlantic bluefin stock.

Rejected Option: Increase minimum commercial size for bluefin tuna to 81 inches (206 cm) CFL (giant size class), or size at first maturity

This alternative would raise the minimum size for bluefin tuna from 73 to 81 inches CFL in the General and Longline categories, and would eliminate tolerances in the Harpoon and Purse Seine categories for large medium bluefin tuna (73 to less than 81 inches CFL). A bluefin tuna measuring 81 inches CFL weighs approximately 300 pounds and is eight years old, which is the age at first maturity. Table 3.24 indicates the 1997 size composition of the commercial bluefin tuna catch.

Ecological Impacts

This alternative would have the effect of increasing the average weight and decreasing the total number of commercial fish landed, compared to the status quo. This alternative would limit bluefin tuna harvest to those fish that are nearing spawning age. These fish have many fewer natural predators than smaller bluefin tuna. Providing these fish added protection and an opportunity to spawn could speed rebuilding, although it is unclear to what degree. This alternative could increase discards, as many large medium bluefin tuna are landed in the commercial categories (averaging approximately 26 percent for all commercial categories). Because fishermen may be able to direct their efforts towards larger fish, the increase in discards may not be as high as the recent numbers of large medium bluefin tuna landed and sold. The number of large medium vs. giant bluefin tuna landed by commercial category in 1997 is shown in Table 3.24.

Social and Economic Impacts

The social and economic impacts of this alternative would be minimal, because the tonnage allowed to be landed would be the same as under the status quo. It would have the effect of decreasing the numbers of commercial sized fish allowed to be landed, and this may result in the quota being caught by fewer vessels. However, because it may take vessels more trips to land a fish, vessels may incur greater costs. In 1997, average prices for giant bluefin tuna were four percent higher than those for large medium bluefin tuna ($7.47/pound vs. $7.18/pound, whole weight), therefore, gross revenues may increase under this alternative.

Conclusion

Although this alternative could protect and relieve pressure on pre-spawning sized fish, it would increase discards. This alternative is rejected.

Table 3.24 Percent breakdown by size class of commercial bluefin tuna for 1997 (NMFS NERO bluefin tuna dealer database).

Category	Large Medium (%)	Giant (%)	Total # of fish
General	32.2	67.8	3,669
Harpoon	27.8	72.2	288
Purse Seine	4.3	95.7	1,271
Incidental	34.0	66.0	241
TOTAL	**25.6**	**74.4**	**5,469**

Rejected Option: Lower minimum size for sale for bluefin tuna to 47 inches (119 cm) CFL (large school size class)

This alternative would lower the minimum size for bluefin tuna to 47 inches for the Longline and Trap categories (previously grouped as Incidental category) and General categories, allow Harpoon category vessels to land and sell one fish from the large school through large medium bluefin tuna per trip (as opposed to just large medium), and would change the large medium bluefin tuna allowance for Purse Seine category vessels to include the large school and small medium size classes. General category vessels were allowed to sell school and medium sized bluefin tuna before July 1992.

Ecological Impacts

This alternative would lower the average size, and thus raise the total number, of fish landed commercially, even under the status quo quota. This alternative could slow rebuilding, although it is unclear to what degree. This alternative would likely reduce discards because commercial fishermen would not need to discard smaller fish. Although there are discards with any minimum size, smaller bluefin tuna may be easier to handle and release unharmed than larger fish. In addition, an increase in the number of fish tagged and released may lead to better monitoring of the stock.

Social and Economic Impacts

The social and economic impacts of this alternative would be minimal because the tonnage allowed to be landed would be the same as under the status quo. It would have the effect of increasing the numbers of commercial sized fish allowed to be landed which could result in the quota being caught by a greater number of vessels. Because the range of large school and small medium bluefin tuna extends beyond the traditionally commercial bluefin tuna fishing grounds of New England, this alternative could result in some commercial revenues and activity shifting from New England to the mid-Atlantic area. This alternative may also reduce overall ex-vessel revenues to the General category. As mentioned above, 1997 average prices for large medium bluefin were slightly lower than those for giant bluefin, and average prices would likely be even lower for large school and small medium bluefin tuna.

Conclusion

This alternative is rejected because it would increase the number of bluefin tuna landed and could slow rebuilding. Under this alternative, discards in the New England area may be reduced as there are few bluefin tuna below 47 inches in that area, and commercial fishermen would most likely have to discard fewer fish than they do now under the 73 inch CFL minimum size. Commercial effort, landings, and discards could increase in the mid-Atlantic area, however, where smaller bluefin tuna (both larger and smaller than 47 inches) are more prevalent.

3.4.2.1.4 Yellowfin Tuna Size Limits

Final Action: Status quo minimum size

The current minimum size for yellowfin tuna is 27 inches CFL for both the commercial and recreational fisheries. This is a higher minimum size than the 3.2 kg minimum established by ICCAT, but was implemented in 1996 to correspond to the bluefin tuna minimum size for identification and enforcement purposes. Although ICCAT allows a discretionary tolerance of 15 percent less than 3.2 kg, the United States permits no tolerance for undersized fish.

Ecological Impacts

Yellowfin tuna are considered fully-fished. Minimum size regulations are intended to conserve juvenile fish in three ways. First, prohibition on landing prevents development of a commercial market for small fish, thereby discouraging fishermen from targeting them. Second, some of the small fish that are discarded will survive and mature to reproduce and contribute to the stock biomass. Third, a minimum size results in fewer fish being retained per mt than would be otherwise. However, to the extent that fishermen cannot control the size composition of the fish they catch, minimum sizes can result in significant discards of undersized fish.

Social and Economic Impacts

Minimum size limits can influence the size composition of the harvest, and will influence the amount of total fishing mortality in a fishery and the nature of the fishery. Under minimum size regulations, fishermen may not retain and/or land fish below the minimum size, thus more yellowfin would be released. There could be some loss of revenue to the commercial fishery associated with the regulatory discards. There could also be some effect on angler consumer surplus, but the extent of potential impacts on the recreational fishery is uncertain. Since this action does not alter the status quo, no social impacts are expected.

Conclusion

The United States has already implemented a higher minimum size than that required by ICCAT. The United States has also prohibited all retention of yellowfin tuna less than the minimum size, rather than allowing a 15-percent tolerance. Raising the minimum size would not be consistent with the objective to minimize bycatch and bycatch mortality. Thus, at this time, NMFS has decided to maintain the current minimum size of 27 inches.

Rejected Option for Yellowfin Tuna Size Limits

Rejected Option: Increase minimum size (both commercial and recreational) for yellowfin tuna to 47 inches (119 cm) CFL

This alternative would increase the minimum size for yellowfin tuna from 27 inches CFL to a size which is above their size at first maturity. Yellowfin reach sexual maturity at a size of about 45 inches (115 cm) CFL. A minimum size of 47 inches was chosen for this alternative because it corresponds to the large school size class for bluefin tuna.

Ecological Impacts

Overall impacts on the yellowfin tuna stock would be minimal due to the very small percentage of yellowfin tuna that the United States is currently estimated to land in the Atlantic compared to other nations (the United States landed six percent of yellowfin tuna in the Atlantic in 1997). The average size of yellowfin tuna landed would increase, but overall landings could decrease. Large Pelagic Survey data from 1996 and 1997, indicate that 91 percent of yellowfin tuna landed by recreational anglers were below 47 inches CFL. The yellowfin tuna numbers may be skewed by the fact that the Large Pelagic Survey does not cover the Gulf of Mexico, where yellowfin tuna tend to be larger, but the amount of yellowfin tuna caught recreationally in the Gulf of Mexico is much less than that caught in the northwest Atlantic.

A review of commercial data from dealer weighout slips for 1997 indicates that, in terms of numbers of fish, 92.5 percent, 66.7 percent, and 4.8 percent of the yellowfin tuna caught with rod and reel in the Atlantic, longline in the Atlantic, and longline in the Gulf of Mexico, respectively, were below 47 inches CFL. By weight, and for the same areas, 84.9 percent, 50.8 percent, and 0.8 percent of yellowfin tuna landed were below 47 inches CFL. The majority of commercial landings (by weight) of yellowfin tuna of all sizes are made using longline gear in the Gulf of Mexico (NMFS, 1998).

Given the size composition data for both commercial and recreational landings, discards of undersized yellowfin tuna could increase substantially under this alternative. This alternative could also cause recreational and commercial effort targeting yellowfin tuna to shift to other HMS, as well as other fisheries.

Social and Economic Impacts

Due to the large number of yellowfin tuna currently caught that are below 47 inches CFL, this alternative could cause significant economic losses to the commercial sector. Using weights from the longline fishery in the Atlantic, about 50 percent of the revenues from yellowfin tuna, and 40 percent of the revenues could be lost as a result of this alternative. This alternative could cause shifts in fishing activity to areas where there are larger fish, which would result in lower economic losses, but the loss of revenue would most likely still be substantial.

For the recreational fishery, this alternative would mean that most of the recreationally caught yellowfin tuna could not be retained, which could seriously impact angler consumer surplus, as well as charterboat revenues and the communities that support the recreational and for-hire fisheries. The degree of impact on the recreational fishery, while most likely significant, is unknown.

Conclusion

While this alternative is viable, it is rejected at this time due to the increase in discards that could occur, particularly in view of the low percentage of yellowfin and bigeye tuna that the United States lands in the Atlantic compared to other nations (and thus the overall impact on F stock-wide). This alternative would also have large adverse economic impacts on both recreational and commercial fishermen and communities in the United States. There are no significant safety implications of this alternative.

3.4.2.1.5 Yellowfin Tuna Recreational Retention Limits

Final Action: Establish a recreational retention limit of three yellowfin tuna per person per day

This retention limit for yellowfin tuna is designed to prevent excessive landings in the recreational fishery and maximize fishing opportunities. Yellowfin tuna are considered fully-exploited, and the latest SCRS report indicates that the current fishing mortality rate may be higher than that which would support maximum sustainable yield on a continuing basis. NMFS is also required to implement the ICCAT recommendation to limit effective fishing effort for yellowfin tuna to 1992 levels. Limits in the commercial fishery include prohibitions on pair trawl and driftnet gear for yellowfin tuna, as well as limited access in the purse seine and longline fisheries. Since NMFS maintains that limiting access to the recreational fishery is not a feasible option at this time, the retention limit is an alternate management measures that is consistent with the ICCAT recommendation. Retention limits might also help to encourage catch and release fishing of this species which has been designated fully fished. Many comments noted that voluntary retention limits currently exist in Delaware and North Carolina, as well as other areas, where charterboats and private anglers do not exceed three yellowfin tuna per person per day. There are no significant safety implications of these yellowfin tuna retention limit alternatives.

Ecological Impacts

This retention limit limits the harvest of yellowfin tuna while still allowing for consumptive use of the species. Data from the 1996 and 1997 Large Pelagic Survey indicate that 79 percent of trips targeting large pelagic species, including yellowfin tuna, have 3 or more anglers on board. Large Pelagic Survey data also indicate that under present conditions with no retention limit, 94.9 percent of trips that land at least one yellowfin tuna, land nine yellowfin tuna or less. These data indicate that this measure will have a small positive ecological impact, but it will not restrict yellowfin tuna landings on most recreational fishing trips. This action could increase discards as anglers may need to release fish if they have already reached the retention limit. Since most fishing trips will not be restricted by this retention limit, however, any increase in discards due to this action will be minimal.

Social and Economic Impacts

This action may discourage fishermen from paying for charter/headboat trips if they see the retention limit as limiting their fishing activity. As indicated above, however, this retention limit would limit very few anglers or trips on which yellowfin tuna are landed. Based on the 1997 average yellowfin tuna weight of approximately 33 pounds, a catch limit of three fish per person would amount to approximately 99 pounds of yellowfin tuna for each angler per trip.

Chartered vessels typically have four or six anglers on board. Large Pelagic Survey data indicate that under present conditions with no retention limit, 98.4 percent of trips that land at least one yellowfin tuna, land 12 yellowfin tuna or fewer, and 99.9 percent of trips which land at least one yellowfin tuna, land 18 yellowfin tuna or fewer. Therefore, this alternative would likely have little impact on charter operations or revenues. As also mentioned above, this retention limit would encourage catch and release fishing which is increasingly popular for yellowfin tuna and other pelagic species caught in the recreational fishery.

Conclusion

Following the 1998 stock assessment, SCRS concluded that the current fishing mortality rate for yellowfin is probably greater than that which would support MSY (SCRS, 1998). Therefore, it is critical to ensure that effective fishing effort does not increase further. NMFS is concerned about the status of yellowfin tuna and the need to ensure consistency with the ICCAT recommendation to limit the effective level of fishing effort.

In order to reduce and/or prevent excessive recreational catches and maintain fishing opportunities, a recreational daily retention limit of three fish per person for yellowfin tuna is warranted. This measure is also consistent with the ICCAT recommendation on limiting effective fishing effort for yellowfin tuna. Measures taken to implement this recommendation in the commercial fishery for yellowfin tuna include the prohibitions on pair trawl and driftnet gear for all Atlantic tunas, and limited access in the purse seine and pelagic longline fisheries.

Rejected Option for Yellowfin Tuna Recreational Retention Limit

Rejected Option: No recreational retention limit for yellowfin tuna

Even though yellowfin tuna are fully-fished, and may be overfished, current data suggest that catch rates per angler are low and it may not be necessary at this time to impose a retention limit. Conversely, catch rates are known to be quite high for those fishermen who are consistently successful at catching yellowfin tuna. Recreational (rod and reel) harvest of yellowfin tuna was reported as 46 percent of the total U.S. landings for this species in 1997 (NMFS, 1998b).

Ecological, Social, and Economic Impacts

For a description of the fishery for yellowfin tuna, including the economics of the fishery under the status quo, see the description of fisheries in Chapter 2 of the FMP.

Conclusion

This alternative is rejected. While yellowfin tuna are not yet listed as overfished, NMFS maintains that in order to prevent excessive landings of yellowfin tuna in the recreational fishery and maximize fishing opportunities, a recreational retention limit is warranted. This measure is also consistent with the ICCAT recommendation on limiting effective fishing effort for yellowfin tuna.

3.4.2.1.6 Bigeye Tuna Size Limits

Final Action: Status quo minimum size

The current minimum size for bigeye tuna is 27 inches CFL for both the commercial and recreational fisheries. This is a higher minimum size than the 3.2 kg minimum established by ICCAT, but was implemented in 1996 to correspond to the bluefin tuna minimum size for identification and enforcement purposes. Although ICCAT allows a discretionary tolerance of 15 percent, the United States permits no tolerance for undersized fish. There are no significant safety implications of this alternative.

Ecological Impacts

Minimum size regulations, in general, are intended to conserve juvenile fish in three ways. First, prohibition on landing prevents development of a commercial market for small fish, thereby discouraging fishermen from targeting them. Secondly, some of the small fish that are discarded will survive and mature to reproduce and contribute to the stock biomass. Third, a minimum size results in fewer fish being retained per mt than would be otherwise. The magnitude of numbers of bigeye tuna discarded is unclear, as is the extent to which regulatory discards result from the current minimum size.

Economic and Social Impacts

Minimum size limits can influence the size composition of the landings, and will influence the amount of total fishing mortality in a fishery and the nature of the fishery. Under minimum size regulations, fishermen may not retain and/or land fish below the minimum size, thus more bigeye tuna would be released. There could be some loss of revenue to the commercial fishery associated with the regulatory discards. There could also be some effect on angler consumer surplus, but the extent of potential impacts on the recreational fishery is uncertain.

Conclusion

The United States has already implemented a higher minimum size than that required by ICCAT. The United States has also prohibited all retention of fish less than the minimum size, rather than allowing a 15-percent tolerance. Raising the minimum size would not be consistent with the objective to minimize bycatch and bycatch mortality. Thus, at this time, NMFS has decided to maintain the current minimum size of 27 inches (69 cm) CFL. There are no significant safety implications of this alternative.

Rejected Options for Bigeye Tuna Minimum Size

Rejected Option: Increase minimum size (commercial and recreational) for bigeye tuna to 47 inches (119 cm) CFL

This alternative would increase the minimum size for bigeye tuna from 27 inches CFL to a size which is above their size at first maturity. Bigeye reach sexual maturity at approximately 41 inches (105 cm) CFL. A CFL of 47 inches was chosen for this alternative because it corresponds to the large school size class for bluefin tuna. There are no significant safety implications of this alternative.

Ecological Impacts

Overall impacts on the bigeye tuna stocks would be minimal because the United States landed only one percent of bigeye tuna in the Atlantic in 1997. The average size of bigeye tuna landed would increase, but overall landings could decrease. Large Pelagic Survey data from 1996 and 1997, indicate that 27 percent of bigeye tuna caught by recreational anglers were below 47 inches CFL.

A review of commercial data from dealer weighout slips for 1997 indicates that, in terms of numbers of fish, 61.6 percent, 40.5 percent, and 16.4 percent of the bigeye tuna caught with longline in the Atlantic, longline in the Caribbean, and longline in the Gulf of Mexico, respectively, were below 47 inches CFL. By weight, the numbers are 40.5 percent, 23.4 percent, and 7.9 percent for bigeye tuna. Most landings are made using longline gear in the Atlantic.

Due to the above numbers for both commercial and recreational landings, discards of undersized bigeye tuna could increase substantially under this alternative. This alternative could also cause recreational and commercial effort targeting bigeye tuna to shift to other HMS, as well as other fisheries.

Social and Economic Impacts

Due to the large number of bigeye tuna currently caught that are below 47 inches CFL, this alternative could cause significant economic losses to the commercial sector. Using weights from the longline fishery in the Atlantic, about 40 percent of the revenues from bigeye tuna could be lost as a result of this alternative. This alternative could cause shifts in fishing activity to areas where there are larger fish, which would result in lower economic losses, but the loss of revenue would most likely still be substantial.

For the recreational fishery, this alternative would mean that much of the bigeye tuna could not be retained, which could seriously impact angler consumer surplus, as well as charter/headboat revenues and the communities that support the recreational and for-hire fisheries. The degree of impact on the recreational fishery, while most likely significant, is unknown.

Conclusion

While this alternative is viable, it is rejected at this time due to the increase in discards that could occur, particularly in view of the low percentage of bigeye tuna that U.S. fishermen land in the Atlantic Ocean compared to other nations (and thus the overall impact on F stock-wide). This alternative would also have large adverse economic impacts on both recreational and commercial fishermen and communities in the United States.

3.4.2.2 North Atlantic - Swordfish Rebuilding

3.4.2.2.1 Swordfish Size Limits

In 1996 and again in a 1998 SCRS report, ICCAT scientists concluded that substantial gains in North Atlantic swordfish yield could accrue if fishing mortality on small swordfish could be reduced (SCRS, 1996a, 1998a). In 1998, SCRS scientists expressed concern about the high catches of small swordfish and the lack of and possible inaccuracies of size data from many countries. The only international conservation measure in place to protect small Atlantic swordfish is a minimum size. In 1995, ICCAT recommended an alternative minimum size limit of 44 pounds ww (33 pounds dw or 119 cm lower jaw fork length) with no tolerance and records of discards . Other ICCAT countries (except Canada) have implemented a minimum size of 41 pounds dw, but this minimum size limit includes a 15-percent tolerance per trip of undersized swordfish. NMFS does not support any minimum size with a tolerance due to the difficulty in enforcing such a regulation. This was adopted by the United States and Canada in 1996.

To facilitate enforcement of the U.S. minimum size, and to implement the alternate minimum size recommendation, NMFS has prohibited the import of undersized Atlantic swordfish or swordfish pieces weighing less than 33 pounds dw unless documented as being derived from a fish weighing more than 33 pounds dw. To monitor swordfish imports by harvesting country, NMFS requires all U.S. swordfish importers to obtain a dealer permit and report all swordfish import activities on a bi-weekly basis. NMFS has also implemented a Certificate of Eligibility program to validate that all Atlantic swordfish entering the United States weigh more than 33 pounds dw, or if the swordfish is processed into pieces, that those pieces were derived from swordfish weighing more than 33 pounds. These requirements aid in enforcing the U.S. minimum size and also facilitate the tracking of swordfish imports.

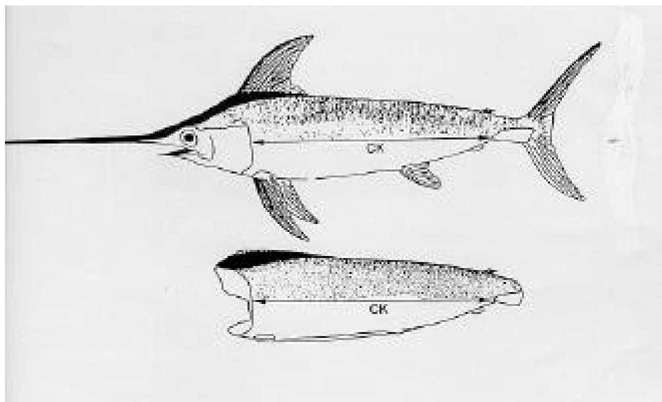
Because dead discards of swordfish are not reported by all other fishing nations, NMFS cannot evaluate the “success” of the minimum size limit in reducing bycatch mortality on the entire north Atlantic stock. However, NMFS evaluated the current minimum size limit in response to comments from the ICCAT Advisory Committee Swordfish Working Group and other members of the public. The evaluation found that despite voluntary efforts by U.S. pelagic longline fishermen and the switch to the lower minimum size, the U.S. fishery has not substantially reduced mortality of undersized swordfish (Cramer and Adams, 1998). The minimum size, therefore has the potential to increase “regulatory” discards of swordfish weighing less than 33 pounds dw, although longline dead discards decreased from 1996 to 1997. For those swordfish released alive as well as billfish, pelagic longline fishermen have championed tagging efforts.

Mortality of undersized swordfish by other U.S. fishermen (e.g., squid trawls) is controlled only to the extent that an incidental catch limit eliminates the incentive for “targeting” swordfish in a non-directed fishery. Currently, swordfish caught in squid trawls are reported to NMFS through the dealer reporting system (landings) and through the observer system (landings plus discards). NMFS will continue to evaluate catch rates of swordfish of all sizes in all non-directed fisheries in order to control fishing mortality of small swordfish. Mortality of small swordfish in the international fishery is monitored by landings because many harvesting countries land the 15-percent tolerance or more (For more information, consult SCRS, 1998a).

Final Action: Status quo size limit (33 pounds dw, 119 cm LJFL, 29 inches CK)

Figure 3.4 indicates the measurement of swordfish for compliance with the 29 inches cleithrum to keel minimum size.

Figure 3.4 Measurement of swordfish: 29 inches cleithrum to keel.



Ecological Impacts

This action maintains the status quo size limit adopted by the United States in 1996. This minimum size may encourage fishermen to avoid concentrations of small swordfish. In some cases, however, fishermen continue to fish for swordfish in known concentration areas of undersized fish and discard the undersized fish due to the proximity of the fishing grounds to port. This minimum size of 33 pounds dw (73 inches CK) is less than the presumed size at maturity for Atlantic swordfish. Additionally, pelagic longline fishing gear is not selective of size classes; 25 percent (by number) of swordfish caught were discarded in 1996 (presumed undersized; Cramer and Adams, 1998). In some areas, 45 percent of swordfish (by number) were discarded, such as in the Florida East Coast area in 1996. Increasing the minimum size limit may not decrease catches of small swordfish, but rather could decrease the landings only. Thus, increasing the minimum size limit may not result in reduced mortality on immature swordfish. An increase in minimum size could be effective, if accompanied by time/area closures or other restrictions that reduce mortality on small size classes of swordfish or increase post-release survival. Possible useful time/area closures could include known nursery areas. Refer to Section 3.5 for a discussion on time/area closures as a means to minimize bycatch.

Social and Economic Impacts

Because this fishery operates on a quota management system, and the price per pound small swordfish is lower than that for larger swordfish, this alternative increased the total ex-vessel value of the swordfish quota relative to years in which there was. This FMP will also count dead discards against the quota, further providing an incentive for fishermen to avoid discarding swordfish and to seek areas of larger fish. In 1997, approximately 467.1 mt of swordfish were discarded dead (NMFS, 1998b), which translates to a decrease of $3.05 million in ex-vessel revenues foregone. Increasing the minimum size limit may not decrease catches of small swordfish, but rather could decrease the landings and thus the revenues only. To the extent that swordfish fishermen could successfully avoid swordfish nursery areas, economic impacts would be minimal. Because nursery areas appear to be rather large, it appears that social impacts could be large if fishermen must re-locate in order to avoid concentrations of small swordfish. This alternative has no safety at sea implications.

Conclusion

The status quo size limit is the final action at this time. If time/area closures are effective at removing fishing effort from nursery areas, dead discard rates could be lowered substantially, allowing for all swordfish caught in other areas to be landed. In that case, NMFS may reconsider negotiating a change in minimum size limits at ICCAT, to minimize discards of small swordfish in nursery areas but allow for fishermen to retain all swordfish in other areas. NMFS may seek international cooperation in reducing mortality on small swordfish via the ICCAT process in 1999.

Rejected Size Limit Options

Rejected Option: Increase the minimum size for Atlantic swordfish to size at maturity

NMFS considered increasing the minimum size for swordfish to the size at maturity based on the sex of the fish caught. Thus, for males the minimum size would be 37 pounds dw and females the minimum size would be 122.6 pounds dw. One reason NMFS rejects this alternative is because swordfish are not easily sexed externally, making it impossible, in most cases, for fishermen to discard undersized fish by sex. Occasionally, a fishermen will haul a swordfish on board that releases milt, or sperm, indicating a male swordfish. Likewise, female swordfish are sometimes brought on board releasing eggs. However, fish that are not releasing eggs or sperm cannot be easily sexed alive.

Ecological Impacts

Increasing the size limit of swordfish would, in theory, protect small swordfish and would result in increased yield from the North Atlantic stock. However, the predominant harvesting gear of North Atlantic swordfish is the pelagic longline which cannot select for fish over a certain size, other than avoiding areas with concentrations of small fish. This regulation would therefore increase bycatch by increasing the discard of small swordfish. NMFS does not expect that a higher minimum size for swordfish will increase the yield of this stock catches of small swordfish. In conjunction with time/area closures, however, an increased size limit may be an effective conservation measure to discourage fishermen from fishing in concentrated areas of small swordfish. Because it is NMFS' intention that discards of swordfish would be counted against the quota by ICCAT, this alternative would not be expected to increase the length of the fishing season in an effort to land the swordfish quota, comprised of swordfish above a higher minimum size.

Social and Economic Impacts

U.S. pelagic longline fishermen do not appear to be able to select particular size classes of swordfish in current fishing areas. Because discards will be counted against the quota, this alternative would decrease the total ex-vessel worth of the Atlantic swordfish quota and may result in negative social and economic impacts on the fishery. Increasing the minimum size might cause fishermen to travel farther offshore to avoid concentrations of small swordfish, thus increasing their trip costs and possibly increasing safety risks.

Conclusion

This option is rejected because it may increase bycatch mortality. In addition, this option may have negative social and economic impacts. Thus, this alternative is inconsistent with NS 8 and NS 9.

Rejected Option: Eliminate the minimum size for Atlantic swordfish

This option would eliminate the minimum size for swordfish and would force fishermen to retain all swordfish that are hooked. This is currently inconsistent with the ICCAT recommendation. The ICCAT Advisory Committee and other members of the public have indicated support for the elimination of a minimum size for swordfish due to the relative non-selectivity of pelagic longline gear. Fishermen who make longline sets in nursery areas cannot avoid catching small swordfish, and it has been argued that eliminating the minimum size will reduce dead discards. More importantly, this option might force fishermen out of nursery areas since small swordfish are worth less (gross ex-vessel price) than larger swordfish.

Ecological Impacts

There is currently an incentive to avoid undersized fish, however many undersized swordfish are still being discarded dead. Eliminating the minimum size limit for swordfish would result in the landing of all swordfish caught by all fishing gears. This would reduce bycatch of undersized swordfish because those fish would be marketed. However, market prices for small swordfish are typically very low, and fishermen might therefore be influenced to avoid small swordfish. In contrast, this measure might create an incentive for people living and fishing close to nursery areas to target swordfish in those areas due to their proximity to shore and thus, reduced fishing trip costs. The size composition of the catch may change, and include smaller swordfish. Increasing the proportion of small swordfish in the U.S. catch is detrimental to rebuilding.

Social and Economic Impacts

This alternative is likely to increase the value of each longline set because more swordfish per set would be landed (fewer discarded); the increase would be particularly felt by longline fishermen who typically discard a high proportion of their catch due to regulations. However, since small swordfish are often worth less than larger swordfish, this alternative may not increase the ex-vessel revenues of fishermen. This alternative would allow fishermen who currently fish further offshore due to the minimum size restriction to fish inshore or in nursery areas. Thus, fishing trip costs and transit times would be reduced. This alternative may have positive safety implications because fishermen, in some areas, would likely make fewer sets in a trip because they would be able to retain small fish. Decreasing the length of a fishing trip may combat fatigue and maintenance problems which may accumulate during a longer trip.

Conclusion

Rejected. Although this alternative may be consistent with NS 9 by reducing bycatch and bycatch mortality, without any complementary measures such as time/area closures, fishermen would have only a market incentive to avoid smaller fish. This measure is inconsistent with the ICCAT recommendation.

3.4.2.2.2 Swordfish Retention Limits

As international and domestic management measures for north Atlantic swordfish focus on decreasing the annual TAC to rebuild the stock, fishery managers may be able to work with fishery participants to determine optimal parameters within which to conduct these “limited” fishery operations. In the past, seasonal closures affected the gross ex-vessel prices of swordfish. Closure dates cause market gluts and lower prices (as well as storage and handling problems), as fishermen take advantage of the last few fishing days. In response to comments from industry, NMFS established effort control measures to lengthen the season and reduce derby fishing conditions, and provided for delayed offloading in order to decrease safety risks to fishermen, with the intention of increasing the net economic benefit of the catch. Since then, several large swordfish vessels have exited the Atlantic swordfish fishery, which has reduced the current need for commercial retention limits. In addition, VMS will allow for delayed offloading after a directed fishery closure. Therefore, the need for federally managed effort controls in the swordfish fishery may be significantly reduced. With the advice of the HMS AP, NMFS can decide whether effort controls in this fishery are needed in the future (after the implementation of limited access permits). If NMFS identifies effort controls as a management priority for the Atlantic swordfish fishery, the framework measures would allow for retention limits, days between landings, and days at sea. However, the administrative costs increase with implementation of every effort control regulation. Thus, NMFS encourages fishery participants to work together to voluntarily regulate fishing effort and establish parameters for optimal fishing conditions. This may be easier with the implementation of a limited access program.

Final Action: Status quo - no swordfish retention limits in the directed commercial fishery

Effort control measures which may be considered as retention limits in the directed Atlantic swordfish fishery include retention limits and/or days between landings. In the September 1995 final rule (60 FR 46776), NMFS implemented retention limits for the 1996 calendar year. There had been considerable discussion regarding options for establishing variable retention limits, including a retention limit based on the individual vessel's catch history, retention limits for distant-water vs. coastal-water trips, and retention limits by vessel size. There was also discussion of allowing vessels to have a minimum amount of time in port between landings. All of these options were deemed to be difficult to quantify, implement and/or enforce. In the 1995 final rule, NMFS noted in the response to comments on effort controls:

> "The difficulty in classifying distant-water vs. coastal-water vessels and of enforcing different trip limits for them requires the establishment of one trip limit at this time.... The trip limit is based on 90 percent of trips taken in the Grand Banks (distant-water) fishery in 1992 and 1993."

Once the limited access system is in place, there may be expanded options for extending the fishing season for Atlantic swordfish. With a smaller, more definable universe, NMFS may be able to design and implement systems that are efficient for both vessels and for administrative and enforcement purposes. In addition, this FMP requires that pelagic longline vessels complete their logbooks within 48 hours of haulback, which may facilitate enforcement of minimum time in port (logbooks are currently required seven days after offloading). Given that other measures adopted in the FMP may present new options for addressing derby fishing conditions, NMFS will consider retention limits and other effort controls in future rulemaking under the framework provisions of the FMP.

Ecological Impacts

The formation of an intense derby fishery might increase incidental catch rates as fishermen "race for the fish" without heed for increased bycatch rates of immature fish or other regulatory or market-driven discards. However, limited access may reduce the potential for increased derby situations in the future. NMFS will re-evaluate the ecological impacts of the status quo in the future if there appear to be threats to any species as a result of changing fishing patterns.

Social and Economic Impacts

The status quo will not have significant social and economic impacts on commercial swordfish fishermen unless a derby fishery forms. However, the derby nature of the swordfish fishery has been reduced with the departure of several large capacity vessels from the Atlantic swordfish fishery; limited access should reduce the possibility of a derby fishery even more. In addition, VMS will allow for delayed offloading after a directed fishery closure. This may result in increased ex-vessel revenues.

At this time, this alternative has not had significant impact on safety at sea because derby conditions are considered manageable (e.g., no accidents as a result of overloading, or a race for the fish). NMFS will continue to monitor the fishery and may implement retention limits at such time that the fishery may benefit from decreased catch rates or if safety issues arise (e.g., overloaded vessels).

Conclusion

NMFS has received comments in the past requesting effort controls in the Atlantic swordfish fishery. Since that time, the nature of the fishery has changed and the final actions contained in this FMP and implemented by final rule will further benefit Atlantic swordfish fishermen, with regard to effort control measures. NMFS will re-assess the need for effort controls in the future and may implement retention limits in the commercial fishery by the framework process.

Final Action: Swordfish bycatch limits

The intention of bycatch limits is to allow fishermen to land the swordfish they encounter in non-directed fishing operations, thereby reducing discards of swordfish caught "accidentally" (e.g., by squid trawls or pelagic longline "tuna" fishermen). These bycatch limits may also remove any incentive for non-directed fishermen to start targeting swordfish. In the past, these bycatch limits have likely been effective as an incentive to keep fishermen using non-directed gears from targeting swordfish (e.g., squid trawl fishermen). NMFS establishes retention limits to reduce bycatch (and therefore discards) of swordfish by fishermen using gears that are not authorized in the directed swordfish fishery (five swordfish per trip for squid trawl vessels), or by directed fishermen during directed fishery closures (15 swordfish per trip for pelagic longline vessels). Refer to Table 3.25 for a summary of these bycatch limits. NMFS has also established bycatch limits for fishermen with Incidental limited access permits in the swordfish fishery (two swordfish per trip). NMFS will evaluate the effectiveness of bycatch limits in minimizing discards of swordfish in non-directed fisheries and may alter bycatch limits to effectively remove the incentive for fishermen to target swordfish during a closure of the directed fishery. NMFS may adjust these retention limits during the season depending on catch rates and the amount of remaining Directed or Incidental Catch quota. For more information on these limits as they apply to limited access permits, please see Chapter 4.

Table 3.25 Swordfish bycatch limits.

Gear	Swordfish Bycatch Limit
Squid trawl	5 swordfish per trip
Pelagic Longline: Incidental permit (at all times until incidental catch quota is filled)	2 swordfish per trip
Pelagic Longline: Directed Permit during directed fishery closure (until incidental catch quota is filled)	15 swordfish per trip
All other gears	2 swordfish per trip

Ecological Impacts

These limits do not have any apparent ecological impact on the Atlantic swordfish stock because swordfish are managed under a quota system. Therefore, any swordfish landed, regardless of gear type, is counted against the swordfish quota and reported to ICCAT. Limiting retention of swordfish by implementing bycatch limits allows fishermen to utilize those swordfish they encounter but discourages a directed fishing effort for swordfish and therefore is not likely to have any negative effect on the stock. If these limits do not accommodate the magnitude of incidental catch of swordfish and result in increased discards, the impact will be mitigated by counting dead discards against the quota (once adopted by ICCAT.)

Social and Economic Impacts

These retention limits allow fishermen who encounter swordfish while fishing other species to land those fish. Therefore, this action will increase ex-vessel revenues for vessels using fishing gear that is not authorized for use in the directed Atlantic swordfish fishery. This alternative has no effect on safety at sea issues.

Conclusion

Bycatch limits may serve as an incentive for directed fishery participants to avoid swordfish to the extent they can while fishing for other species. This is consistent with NS 9.

Final Action: Status quo - no swordfish retention limits in the recreational fishery except for the existing minimum size

NMFS implements only a minimum size (29 inches CK) to restrict catches of swordfish by the limited recreational fishery. NMFS does not implement retention limits or bycatch limits in this fishery. Should recreational fishing effort increase in the future, NMFS may consider other retention limits to manage this sector of the swordfish fishery. Recreational swordfish fishermen are required to report their catches (retained and discarded swordfish) to any NMFS-sponsored dockside or telephone survey soliciting such information.

Ecological Impacts

Not establishing retention limits on recreational swordfish fishermen will not have an ecological effect on swordfish because recreational and commercial catch is capped overall by a quota. The minimum size, however, will have positive impacts on the stock as recreational catch rates increase because most swordfish caught in the recreational fishery are released alive.

Social and Economic Impacts

This action will not have any social or economic impacts. Recreational catch rates are currently very low and retention limits are not necessary at this time. Recreational fishermen are subject to a minimum size of 33 pounds dw or 29 inches CK. This alternative has no safety at sea implications.

Conclusion

Recreational retention limits (other than the minimum size limit) are not needed at this time. Should recreational catch rates increase and participation as well, retention limits may be useful in the future to slow catch rates and will be included as a framework measure.

Rejected Options for Swordfish Retention Limits

Rejected Option: Retention limit in the commercial fishery

Retention limits have been implemented in the past to control effort in the swordfish fishery. Since that time, the character of the swordfish fishery has changed: larger vessels have exited the Atlantic fishery, prices have declined, fishery effort has slowed, etc. At this time, retention limits do not appear to be needed and would not contribute to furthering the objectives of this FMP relative to swordfish.

Ecological Impacts

Implementing a retention limit does not directly affect the swordfish stock because total landings are limited by an ICCAT quota. However, retention limits may reduce the derby nature of the fishery, allowing fishermen to fish more selectively. This may result in decreased bycatch and increased survival of discarded species. Conversely, retention limits could result in increased dead discards if the last set in a trip places a vessel above the retention limit.

Social and Economic Impacts

In a derby fishery in which large capacity vessels can have an economic advantage over smaller vessels, a retention limit may "level the playing field". The Atlantic pelagic longline fishery for north Atlantic swordfish, despite decreasing quotas, did not reach its landings quota in the Fall of 1998. Lower swordfish prices have reportedly reduced overall directed effort and diminished the likelihood of lengthy directed fishery closures. Further, larger vessels that once participated in the fishery have moved to the Hawaii pelagic longline fishery. NMFS, supported by members of the HMS AP, does not intend to implement a retention limit in this fishery at this time.

Conclusion

This alternative is rejected. Effort controls such as days-at-sea, retention limits, and days-between-landings may be necessary to extend the season. NMFS may consider these measures under the framework in the future. NMFS has received comments that numbers of fish should be used for a retention limit rather than poundage. This might encourage fishermen to target larger fish and might provide an equitable system for slowing catch rates in all areas of the pelagic longline fishery. NMFS intends to wait for the evaluation of other implemented measure sin this FMP, including limited access, before assessing wether effort controls need to be re-considered in the commercial swordfish fishery.

Rejected Option: Recreational retention limits for swordfish

Ecological Impacts

At this time, this retention limit would not likely affect the swordfish stock due to current reported low swordfish recreational fishing effort

Social and Economic Impacts

This retention limit would not have social or economic impacts on recreational fishermen due to current reported low swordfish recreational fishing effort.

Conclusion

NMFS rejects this alternative as unnecessary at this time. Retention limits are included in the framework of this FMP (refer to Section 3.10).

3.4.2.3 Atlantic Sharks

3.4.2.3.1 Prohibited Species

In 1997, NMFS prohibited possession of five species of sharks: sand tiger, bigeye sand tiger, whale, basking, and white sharks. These species were identified as highly susceptible to overexploitation and the prohibition on possession was a precautionary measure to ensure that directed fisheries did not develop.

NMFS has received requests to consider separate management measures, including prohibitions on possession, for dusky and night sharks due to the stock status of these species. Dusky, night, and sand tiger sharks were petitioned and added to Candidate Species List under the Endangered Species Act (ESA) in the fall of 1997. However, NMFS had already prohibited possession of sand tigers sharks in the commercial and recreational fisheries, and thereby had already afforded those species the maximum protection possible within its fisheries management jurisdiction. The alternatives regarding possession of dusky and night sharks are discussed below.

NMFS has also received requests to consider a prohibition on possession of sawfish, a species of ray, due to its stock status, restricted geographical range, and vulnerability to capture in fishing nets. However, under the Magnuson-Stevens Act, Secretarial authority is limited to those Atlantic highly migratory species defined as tuna species, marlins, oceanic sharks, sailfishes, and swordfish, and to those species for which the appropriate fishery management council fails to act, if the fishery requires conservation and management. As sawfish is not a species of shark, this species does not fall under Secretarial jurisdiction. NMFS may consider future management measures in coordination with those States, Councils, and/or Commissions that have the authority to develop such measures.

Final Action: Prohibit possession of all sharks except those that are expected to be able to sustain fishing mortality; Allow retention (consistent with established quotas and retention limits) of certain commonly landed LCS (sandbar, silky, tiger, blacktip, spinner, lemon, bull, nurse, smooth hammerhead, scalloped hammerhead, great hammerhead), pelagic sharks (blue, shortfin mako, common thresher, porbeagle, oceanic whitetip) and SCS (Atlantic sharpnose, blacknose, finetooth, bonnethead) within Federal waters. Redefine management categories accordingly.

This action prohibits the retention of all sharks unless their stock sizes can support and sustain fishing mortality sufficiently to meet this FMPs objectives. Retention is restricted to 11 species of LCS, five species of pelagic sharks, and four species of SCS within Federal waters, consistent with established commercial quotas and recreational retention limits. Possession of all other shark species, including dusky and night sharks, is prohibited. All sharks not authorized for retention must be released in a manner that ensures the maximum probability of survival. This action does not apply to spiny dogfish (*Squalus acanthias*) because this species will be managed under the Spiny Dogfish FMP under the jurisdiction of the New England and Mid-Atlantic Fishery Management Councils.

This action requires recategorizing sharks. The revised shark groupings are presented in Table 3.26. NOTE: Consistent with the final action under Section 3.4.2.3.4, a new group of deepwater/other shark species is established for species formerly unregulated (NMFS formerly only collected data on these species). Thus, NMFS prohibits finning of sharks, regardless of species. These deepwater/other species are not subject to the permit and reporting requirements, retention and size limits, or quotas established in this FMP. NMFS may consider additional management measures for this group in the future.

This action establishes a change from a management policy that prohibits possession of certain species known to be vulnerable to overfishing to a management policy that only allows possession of certain species known or expected to be able to withstand specified levels of fishing mortality. The status of shark stocks will be evaluated annually as part of the SAFE Report. Based on these results, NMFS will work in conjunction with the HMS AP to evaluate whether any changes to the management categories are warranted. Any changes would be made following the framework procedures described under Section 3.10. As the number of species that would be authorized for retention is reduced by about 50 percent, this action should reduce enforcement burden and costs considerably, especially because many of the species that are removed from the list of species that could previously be retained are difficult to identify.

Table 3.26 Sharks in the Management Unit by Species Groups as Established in the FMP.

Large Coastal Sharks	
Ridgeback Species	
Sandbar	Silky

Tiger	*Carcharhinus plumbeus*
	Carcharhinus falciformis
	Galeocerdo cuvieri
Non-Ridgeback Species	
Blacktip	*Carcharhinus limbatus*
Bull	*Carcharhinus leucas*
Lemon	*Negaprion brevirostris*
Nurse	*Ginglymostoma cirratum*
Spinner	*Carcharhinus brevipinna*
Great hammerhead	*Sphyrna mokarran*
Scalloped hammerhead	*Sphyrna lewini*
Smooth hammerhead	*Sphyrna zygaena*
Small Coastal Sharks	
Atlantic sharpnose	*Rhizoprionodon terraenovae*
Blacknose	*Carcharhinus isodon*
Bonnethead	*Sphyrna tiburo*
Finetooth	*Carcharhinus acronotus*
Pelagic Sharks	
Blue	*Prionace glauca*
Oceanic whitetip	*Carcharhinus longimanus*
Porbeagle	*Lamna nasus*
Shortfin mako	*Isurus oxyrinchus*
Thresher	*Alopias vulpinus*
Prohibited Species	
Atlantic angel	*Squatina dumerili*
Basking	*Cetorhinus maximus*
Bigeye thresher	*Alopias superciliousus*
Bignose	*Carcharhinus altimus*
Caribbean reef	*Carcharhinus perezi*
Caribbean sharpnose	*Rhizoprionodon porosus*
Dusky	*Carcharhinus obscurus*
Galapagos	*Carcharhinus galapagensis*
Longfin mako	*Isurus paucus*
Narrowtooth	*Carcharhinus brachyurus*
Night	*Carcharhinus signatus*
Sand tiger	*Odontaspis taurus*
Bigeye sand tiger	*Odontaspis noronhai*
Sevengill	*Heptranchias perlo*
Sixgill	*Hexanchus griseus*
Bigeye sixgill	*Hexanchus vitulus*
Smalltail	*Carcharhinus porosus*
Whale	*Rhincodon typus*
White	*Carcharodon carcharias*

Table 3.26 (continued)

Deepwater and Other Sharks

Iceland cat shark	*Apristurus laurussoni*
Smallfin cat shark	*Apristurus parvipinnis*
Deepwater cat shark	*Apristurus profundorum*
Broadgill cat shark	*Apristurus riveri*
Marbled cat shark	*Galeus arae*
Blotched cat shark	*Scyliorhinus meadi*
Chain dogfish	*Scyliorhinus retifer*
Dwarf catshark	*Scyliorhinus torrei*
Japanese gulper shark	*Centrophorus acuus*
Gulper shark	*Centrophorus granulosus*
Little gulper shark	*Centrophorus uyato*
Kitefin shark	*Dalatias licha*
Flatnose gulper shark	*Deania profundorum*
Portuguese shark	*Cetroscymnus coelolepis*
Greenland shark	*Somniosus microcephalus*
Lined lanternshark	*Etmopterus bullisi*
Broadband dogfish	*Etmopterus gracilispinnis*
Caribbean lanternshark	*Etmopterus hillianus*
Great lanternshark	*Etmopterus princeps*
Smooth lanternshark	*Etmopterus pusillus*
Fringefin lanternshark	*Etmopterus schultzi*
Green lanternshark	*Etmopterus virens*
Cookiecutter shark	*Isistius brasiliensis*
Bigtooth cookiecutter	*Isistius plutodus*
Smallmouth velvet dogfish	*Scymnodon obscurus*
Pygmy shark	*Squaliolus laticaudus*
Roughskin spiny dogfish	*Squalus asper*
Blainville's dogfish	*Squalus blainvillei*
Cuban dogfish	*Squalus cubensis*
Bramble shark	*Echinorhinus brucus*
American sawshark	*Pristiophorus schroederi*
Florida smoothhound	*Mustelus norrisi*
Smooth dogfish	*Mustelus canis*

Ecological Impacts

This action will likely have a combination of the ecological impacts discussed under the status quo and the prohibitions on dusky and night sharks under current management policy, and will allow for faster rebuilding or stock maintenance for uncommon and seriously depleted species if bycatch mortality is not too large. Dusky shark catch rate data indicate large population declines since the early 1970s and observer data indicate that dusky sharks have a low post-release survival rate in commercial bottom longline shark fisheries (only about 27 percent come to the vessel alive, see Table 9, Branstetter and Burgess, 1998a). In recreational fisheries, sharks are generally considered to have high post-release survival rates, indicating that prohibition of dusky sharks in recreational fisheries may contribute substantially to rebuilding. Limited evidence indicates that catches of night sharks have declined considerably in recent years and that this species has an extremely low ability to withstand even bycatch mortality (see Castro and Woodley, 1997). To the extent that this action reduces the potential for fisheries or markets to develop on less-frequently landed species, this action will have positive ecological impacts. This action restricts possession in all commercial and recreational fisheries within Federal waters to those species known or expected to be able to withstand specified levels of fishing mortality.

Social and Economic Impacts

Prohibiting possession of dusky sharks will likely have adverse social impacts in both commercial and recreational fisheries because dusky sharks are preferentially retained relative to capture in the commercial directed shark fisheries and are targeted as a large game fish in recreational fisheries. The prohibition on possession of night sharks will likely have minimal social impacts because night sharks represent only a minor portion of the commercial and recreational catch. For the other LCS, pelagic sharks, and SCS, this action will likely have negligible social impacts because uncommon species are prohibited.

As with the ecological impacts, this action will likely have a combination of the economic impacts discussed under status quo and the prohibitions on dusky and night sharks. This action may reduce revenues of commercial fishermen because the dusky shark comprised approximately five and two percent of LCS commercial landings by weight in 1996 and 1997, respectively. This action will likely have minimal economic impacts because night sharks represent less than one percent of total LCS landings for both the commercial and recreational fisheries (see Chapter 2). For the other LCS, pelagic sharks and SCS, this action will likely have negligible economic impacts because only the uncommon species, which constitute a minor portion of the landings, are prohibited.

Conclusion

This action is selected because it helps prevent development of directed fisheries or markets for uncommon or seriously depleted species. This action is selected for dusky and night sharks due to catch rate data that indicate large population declines since the early 1970s, and will allow for faster rebuilding for this species, thereby enhancing LCS rebuilding, if bycatch mortality is not too large.

Rejected Options for Prohibited Species

Rejected Option: Status quo (prohibition on possession of whale, basking, sand tiger, bigeye sand tiger, and white sharks within Federal waters; catch-and-release only fishing for white sharks)

This alternative would maintain the current prohibition on possession of whale, basking, sand tiger, bigeye sand tiger, and white sharks within Federal waters. This alternative would also maintain the current allowance for catch-and-release only fishing for white sharks.

Ecological Impacts

The 1998 SEW did not conduct species-specific stock assessments on these species due to lack of sufficient data, therefore it cannot be determined whether current fishing mortality rates (as a result of bycatch mortality) are sustainable. However, this alternative would maintain the maximum protection for whale, basking, sand tiger, bigeye sand tiger, and white sharks within Federal waters, short of implementing regulations to reduce bycatch and bycatch mortality rates in other fisheries that encounter these species.

Social and Economic Impacts

This alternative would not be expected to have additional social or economic impacts because fishermen are already operating under these restrictions.

Conclusion

This alternative is rejected because it could allow directed fisheries or markets to develop for other uncommon or seriously depleted species. Limiting prohibitions on possession to these species may result in unsustainable increases in fishing mortality on other vulnerable species or those not yet exploited. Also, there are ecological benefits to prohibiting retention of dusky and night sharks, namely enhancing LCS rebuilding, which are addressed in the final action.

Rejected Option: Maintain management policy to prohibiting possession of selected species of sharks; add dusky and night sharks only to the prohibited species group

This alternative would maintain the current management policy that prohibits possession of certain species known to be vulnerable to overfishing and would add dusky and night sharks only to the prohibited species group. This alternative would also maintain the current allowance for catch-and-release only fishing for white sharks.

Ecological Impacts

This alternative would allow retention of several species not commonly landed and would prohibit possession of dusky and night sharks only. Catch rate data indicate large population declines of dusky and night sharks since the early 1970s and this alternative would allow for faster rebuilding for these species if bycatch mortality is not too large (NMFS 1996, Castro and Woodley 1997, NMFS 1998a). Observer data indicate that dusky sharks have a low post-release survival rate in commercial bottom longline shark fisheries (only about 27 percent come to the vessel alive, see Table 9, Branstetter and Burgess, 1998a). In recreational fisheries, sharks are generally considered to have high post-release survival rates, indicating that prohibition of dusky and night sharks in recreational fisheries may contribute substantially to rebuilding. In 1996 and 1997, approximately 14,000 dusky sharks per year were landed in recreational fisheries (see Chapter 2).

Social and Economic Impacts

Prohibiting possession of dusky sharks would likely have adverse social impacts in both commercial and recreational fisheries because dusky sharks are preferentially retained relative to their capture rate in the commercial directed shark fisheries and are targeted as a large game fish in recreational fisheries. Prohibiting possession of night sharks would likely have minimal social impacts because this species represents only a minor portion of commercial and recreational landings. This alternative may result in changes in fishing practices in fisheries other than shark fisheries in order to reduce dusky shark bycatch. In the long term, this alternative would likely enhance rebuilding of LCS, and contribute to a quicker return to an economically-viable shark fishery.

This alternative may reduce revenues of commercial fishermen because the dusky shark is a relatively important species in the commercial fishery and is often confused with the sandbar shark. Dusky sharks comprised approximately five and two percent of LCS commercial landings in 1996 and 1997, respectively. Prohibiting possession of night sharks would likely have minimal economic impacts because night sharks represent only minor portions of commercial or recreational catches. Approximately 6,500 pounds dw and 57 pounds dw of night sharks were landed in the commercial fishery in 1996 and 1997, respectively; in the recreational fishery, about 380 and 90 night sharks were harvested in 1996 and 1997, respectively (see Chapter 2). These landings constitute less than one percent of total LCS landings for both the commercial and recreational fisheries. Accordingly, this alternative is unlikely to result in changes in fishing practices in order to reduce night shark bycatch. This alternative may also increase costs for commercial fishermen by pushing them out of waters where dusky and/or night sharks are abundant and by increasing the time required to sort through the sharks during gear haulbacks. This alternative would increase enforcement costs by prohibiting retention of a species that is relatively common in commercial and recreational HMS fisheries.

Conclusion

This alternative is rejected because of the greater ecological benefits expected under the final action for other uncommon or seriously depleted species, including dusky and night sharks.

Rejected Option: Prohibit possession of all Atlantic sharks (including all LCS, pelagic, and SCS) within Federal waters

This alternative would prohibit possession of all Atlantic sharks subject to Federal management (inclusive of all 72 species of LCS, pelagic sharks, SCS, prohibited species, and deepwater/other species; see Table 1.1) in all commercial and recreational fisheries in Federal waters. Therefore, all Atlantic sharks subject to Federal management would have to be released in a manner that ensures the maximum probability of survival.

Ecological Impacts

This alternative would be equivalent to the rejected options to close the LCS commercial fishery (see Section 3.4.1.3.1) and establish catch and release only recreational fishing for all sharks (see Section 3.4.2.3.2), with the additional effect of closing the pelagic and SCS commercial fisheries as well. This alternative would result in the fastest rebuilding to maximum sustainable yield levels for LCS and would contribute to the maximum extent to the maintenance of pelagic and SCS stocks.

Social and Economic Impacts

This alternative would have immediate and severe social and economic impacts in all shark fisheries as the LCS directed bottom longline and SCS drift gillnet fisheries would likely be eliminated. While the pelagic longline fisheries, the snapper-grouper fisheries, and the reef fish fisheries would likely continue to operate, the reduction in gross revenues may be substantial. It would also severely restrict the directed fishing activities of some pelagic longline vessels during times or in areas of high shark bycatch. To the extent that pelagic longline fishermen would be able to continue to fish but would have to discard all incidentally caught sharks, this alternative may be perceived as "unfair" by pelagic and SCS fishermen that may believe that overfishing in the LCS fisheries is precluding their fisheries from continuing.

Conclusion

This alternative is rejected because some species of sharks are not overfished and because some that are can support some level of fishing mortality during rebuilding. The social and economic benefits provided by landed sharks can thus be realized without further reducing shark stocks.

Rejected Option: Prohibit possession of all LCS; allow retention of commonly landed pelagic sharks (blue, shortfin mako, common thresher, porbeagle, oceanic whitetip) and SCS (Atlantic sharpnose, blacknose, finetooth, bonnethead) within Federal waters

This alternative would prohibit possession of all LCS subject to Federal management (inclusive of all ridgeback and non-ridgeback LCS, see Table 1.1) in all commercial and recreational fisheries within Federal waters, but would allow possession of five species of pelagic sharks and four species of SCS. Therefore, all

LCS subject to Federal management would have to be released in a manner that ensures the maximum probability of survival.

This alternative would change the management policy from a prohibition on possession of certain species known to be vulnerable to overfishing to a management policy that only allows possession of certain species known or expected to be able to withstand specified levels of fishing mortality. As the number of species that can be retained would be reduced by an additional 25 species such that nine easily identified species would be authorized for retention, this alternative should reduce enforcement burden and costs considerably.

Ecological Impacts

This alternative would be equivalent to closing the LCS commercial fishery (see Section 3.4.1.3.1) and establishing catch and release only recreational fishing for all sharks (see Section 3.4.2.3.2), with the additional effect of removing uncommon or seriously depleted species from the pelagic and SCS commercial and recreational fisheries. This alternative would result in the fastest rebuilding to maximum sustainable yield levels for LCS. This alternative would contribute to a limited extent to the maintenance of pelagic and SCS stocks at optimum yield levels; however, as data are limited regarding the ability of these species to sustain fishing mortality, the removal of uncommon species may still result in stock declines. Further stock assessments would be necessary to evaluate current fishing mortality rates relative to maximum sustainable yield and optimum yield levels.

Social and Economic Impacts

This alternative would have immediate and severe social and economic impacts in LCS shark fisheries because the directed bottom longline fishery would be eliminated. This alternative would likely have negligible social and economic impacts for the pelagic shark and SCS fisheries because only the uncommon species, which constitute a minor portion of the landings, would be eliminated. However, the loss of income from LCS shark revenues could substantially reduce revenues in the pelagic longline fisheries, the snapper-grouper fisheries, and the reef fish fisheries that encounter and land LCS incidental to other fishing operations.

Conclusion

This alternative is rejected because the final action to prohibit certain species of LCS (as well as the final actions to establish ridgeback and non-ridgeback LCS with a minimum size on ridgeback LCS, reduce the non-ridgeback LCS quota, and count dead discards and state landings after Federal closures against Federal quotas) indicate that some species of LCS can support limited levels of fishing mortality during rebuilding. The social and economic benefits provided by landed LCS can thus be realized without further reducing LCS stocks or impeding rebuilding.

Rejected Option: Prohibit commercial fishing for, and possession of, all Atlantic sharks within Federal waters

This alternative would prohibit directed fishing for, and possession of, all Atlantic sharks subject to Federal management (inclusive of all 72 species of LCS, pelagic sharks, SCS, prohibited species, and deepwater/other species; see Table 1.1) in all commercial fisheries within Federal waters. Therefore, all Atlantic sharks subject to Federal management caught in commercial fishing operations would have to be released in a manner that ensures the maximum probability of survival. This alternative would be equivalent to the alternative to close the LCS commercial fishery (see Section 3.4.1.3.1), with the additional effect of closing the pelagic and SCS commercial fisheries as well. This alternative would not impact recreational shark fisheries.

Ecological Impacts

This alternative would greatly enhance rebuilding to maximum sustainable yield levels for LCS because the commercial LCS fishery constitutes 60 to 75 percent of total LCS landings by weight and 40 to 50 percent of total LCS landings by number in recent years. While bycatch and bycatch mortality would still occur (and may increase if fishing effort in other commercial fisheries increases as a result of closing the commercial LCS fishery), this alternative would still eliminate a large portion of current LCS mortality and would enhance rebuilding to maximum sustainable yield levels. For pelagic sharks and SCS, this alternative would contribute substantially to the maintenance of these stocks at optimum yield levels. This alternative would result in all Atlantic sharks caught in commercial fishing operations becoming regulatory discards.

Social and Economic Impacts

This alternative would have immediate and severe social and economic impacts in all commercial shark fisheries as the LCS directed bottom longline and SCS drift gillnet fisheries would be eliminated. The reduction in gross revenues may be substantial for fisheries that target other species in addition to sharks. To the extent that pelagic longline fishermen would be able to continue to fish but would have to discard incidentally caught sharks, this alternative may be perceived as "unfair" by pelagic and SCS fishermen who may believe that overfishing in the LCS fisheries is precluding their fisheries from continuing. This alternative may be also perceived as "unfair" by commercial fishing interests if the recreational fishery is allowed to continue.

Conclusion

This alternative is rejected because some species of sharks are not overfished and because some that are can support some level of commercial fishing mortality during rebuilding. The social and economic benefits provided by commercially landed sharks can thus be realized without further reducing shark stocks.

Rejected Option: Prohibit recreational fishing for, and possession of, all Atlantic sharks within Federal waters

This alternative would prohibit possession of all Atlantic sharks subject to Federal management (inclusive of all 72 species of LCS, pelagic sharks, SCS, prohibited species, and deepwater/other species; see Table 1.1) in all recreational fisheries within Federal waters. Therefore, all Atlantic sharks subject to Federal management caught in recreational fishing operations would have to be released in a manner that ensures the maximum probability of survival. This alternative would be equivalent to the alternative to establish catch and release only fishing for all sharks (see Section 3.4.2.3.2). This alternative would not impact commercial shark fisheries.

Ecological Impacts

This alternative would greatly enhance rebuilding to maximum sustainable yield levels for LCS because the recreational LCS fishery constitutes 25 to 40 percent of total LCS landings by weight and 50 to 60 percent of total LCS landings by number in recent years. While bycatch and bycatch mortality would still occur, sharks are believed to have relatively high post-release survival rates in recreational fisheries such that this alternative would eliminate a large portion of current LCS mortality and greatly enhance rebuilding to maximum sustainable yield levels. For pelagic sharks and SCS, this alternative would also enhance stock status and maintenance at optimum yield levels.

Social and Economic Impacts

This alternative would have social impacts by eliminating recreational landings of all sharks. This alternative would eliminate the opportunities for trophy and tournament anglers to bring in their catches and may reduce an angler consumer surplus if no sharks can be retained. This alternative is perceived as “unfair” to recreational fishing interests if commercial fisheries are allowed to continue. It is important to note that this alternative would not prevent anglers from fishing and gaining the benefits of the fishing experience but it would prevent anglers from retaining any of their shark catch. The adverse social impacts of this alternative may be reduced to the extent that there is a growing public opinion that catch-and-release fishing is the preferable recreational fishery for sharks.

The impact of this alternative depends on the willingness for shark anglers to substitute other fish for released sharks. Therefore, this alternative will have greater, but slightly higher, impacts as those discussed under recreational minimum size impacts (see Section 3.4.2.3.2). This is especially true as tournaments would be unable to land any trophy fish. Fisher and Ditton (1992) found that 27 percent of the anglers surveyed fish in order to obtain fish for eating and 18 percent fish in order to obtain a trophy. Given the evidence that shark anglers do not necessarily fish in order to obtain a trophy or for consumption, reductions in angler consumer surplus or the willingness to pay significantly may be mitigated for private vessels. However, it is possible that the angler consumer surplus may be reduced at the tournament level.

Conclusion

This alternative is rejected because some species of sharks are not overfished and because some that are can support some level of recreational fishing mortality during rebuilding. The social and economic benefits provided by recreationally harvested sharks can thus be realized without further reducing shark stocks.

3.4.2.3.2 Shark Recreational Retention and Size Limits

In 1997, the retention limits for Atlantic sharks in recreational fisheries were reduced by 50 percent as a proxy to reducing effective fishing mortality equally across user groups. However, data from 1997 indicate that recreational harvests of LCS were reduced by only 12 percent (in numbers of fish), and for sandbar sharks and blacktip sharks, recreational harvests actually increased by 64 and two percent, respectively (Tables 3.15 and 3.18). Analyses presented at the 1998 SEW indicate that the retention limit reduction was not effective at reducing fishing mortality by the intended 50 percent primarily because most fishing trips were already harvesting only one to two sharks per trip (Babcock and Pikitch, 1998). The recreational fisheries, which often target other species and encounter sharks incidentally, are likely to be able to reduce fishing effort on sharks by not retaining those sharks caught incidentally. Post-release mortality of sharks caught on rod and reel is generally believed to be low such that restricting recreational fisheries to lower retention limits or to catch and release only fishing would afford those fishermen with the opportunity to fish while still achieving a reduction in effective fishing mortality.

In analyzing rebuilding alternatives for LCS for the commercial fishery, NMFS more fully developed the original alternatives based on establishing ridgeback and non-ridgeback LCS subgroups in light of the magnitude of harvest reductions that would be required if LCS continued to be managed as a single group. As described in Chapter 2, analyses of sandbar and blacktip sharks alone indicate that the magnitude of landings reductions needed to rebuild sandbar-based and blacktip-based complexes are not as severe. These analyses indicate that recreational harvests of sandbar and blacktip sharks would need to be reduced by 82 and 81 percent in number of fish, respectively, relative to 1997 harvest levels (Tables 3.15 and 3.18).

Final Action: One shark per vessel per trip with a 4.5 foot minimum size and one Atlantic sharpnose shark per person per trip (no minimum size)

This action reduces the recreational retention limit to one shark per vessel per trip, establishes a minimum size of 4.5 feet FL (equivalent to 137 cm FL) for all sharks, and establishes an allowance for one Atlantic sharpnose shark per person per trip with no minimum size restriction. It will essentially create catch and release only fishing for all sharks less than 4.5 feet FL, other than Atlantic sharpnose sharks.

Ecological Impacts

This action will reduce the harvest of sandbar and blacktip sharks (and, therefore, LCS) by the necessary 82 and 81 percent in numbers of fish, respectively, relative to 1997 harvest levels (Tables 3.15 and 3.18). Analyses of the recreational fishery presented at the 1998 SEW (Babcock and Pikitch, 1998) indicate that a reduction in the recreational retention limit alone would have only a minor reduction in LCS harvest levels relative to 1997 harvest levels because most recreational LCS fishing trips currently harvest less than one LCS per trip. However, a reduction in the recreational retention limit in combination with the selected minimum size will reduce the harvest of sandbar and blacktip sharks by the necessary levels, and thus will meet NS 1 to rebuild overfished fisheries for LCS. This action may exceed the NS 1 requirement to prevent overfishing for the fully fished pelagic sharks and SCS.

This action establishes the same minimum size for the recreational fishery that is implemented in the commercial ridgeback LCS fishery, with the exception that the minimum size for the recreational fishery applies to all sharks and not a subgroup (with an exception for Atlantic sharpnose sharks). The rationale for this action is that post-release mortality of sharks caught in recreational fisheries is believed to be relatively low. As no quantitative estimates for post-release mortality of sharks caught in recreational fisheries (in general or for individual species) are currently available, only qualitative impacts can be discussed at this time. This is in contrast with the relatively high mortality rate of many sharks in commercial fisheries, particularly the non-ridgeback LCS as evidenced by observer data (see discussion under commercial quota alternatives). In commercial fisheries, implementing a minimum size for species that come to the vessel dead will only increase regulatory discards and may actually increase effective fishing mortality. However, for recreational shark fisheries that are believed to have low post-release mortality, a minimum size of 4.5 feet for all sharks will greatly reduce the effective fishing mortality on the most sensitive stages/sizes by essentially implementing catch-and-release fishing on juvenile and subadult sharks. This alternative will shift recreational fishing mortality primarily onto larger, less sensitive adults (some post-release mortality undersized fish would still occur), while still allowing for the recreational fishing experience and limited harvest of some sharks.

According to MRFSS data, approximately 95 percent of LCS harvested in 1997 were below the selected minimum size (Figure 3.5). Therefore, this action should reduce the number of LCS harvested by more than the 82 and 81 percent necessary under the selected LCS rebuilding program. This action will also limit the quantity of sharks that can be harvested on a given trip to one and so will meet the reductions needed for rebuilding where a minimum size alone would not. Because significant recreational fisheries for sharks exist in nearshore waters and coastal bays and estuaries (many of which have been identified as pupping and nursery EFH for juvenile and subadult stages/sizes), one potential drawback with a minimum size in nearshore waters may result if increased fishing effort is directed towards pregnant females as they enter the pupping grounds in coastal bays and estuaries. NMFS will monitor the impacts of this action and may consider additional management measures, such as male only harvest, as warranted to address such circumstances.

This action, though primarily intended as a LCS rebuilding measure, will also affect pelagic and SCS fisheries. In fact, some SCS like Atlantic sharpnose and bonnethead sharks do not reach 4.5 feet (137 cm FL) at full maturity (both Atlantic sharpnose and bonnethead sharks reach maximums of about 110 cm TL. Blacknose sharks reach a maximum of 164 cm TL, which approximates 137 cm FL, such that only the largest blacknose sharks may reach this minimum size. Thus, recreational fishing for SCS would be essentially catch-and-release fishing only under this action except for Atlantic sharpnose sharks. However, SCS are often caught incidentally to other recreational fishing operations such that this action is unlikely to affect the primary targets of those operations.

On the other hand, substantial recreational fisheries target pelagic sharks, especially shortfin mako, thresher, and blue sharks, and reducing the recreational retention limit may contribute to the stock status of these species. Implementing a 4.5 feet FL minimum size will have relatively minor ecological impacts on pelagic sharks because most of the pelagic sharks currently retained exceed 4.5 feet FL. This minimum size is smaller than the length equivalent of the 100-pound minimum size (approximately 162 cm FL) for mako sharks that was considered in the 1993 Atlantic shark FMP and was suggested in scoping meetings for the development of this FMP. However, to the extent that this alternative supports voluntary restrictions on harvest of juvenile and subadult sharks, faster rebuilding may result.

Reducing the allowance of Atlantic sharpnose sharks per person from two to one will likely have moderate ecological impacts as most anglers currently harvest less than two Atlantic sharpnose sharks per trip. This action for Atlantic sharpnose sharks is a preventative measure to increase the probability that any shifts in recreational fishing effort and harvest away from the overfished LCS to Atlantic sharpnose sharks are sustainable. However, pending additional scientific evaluation, it cannot be determined if current or reduced fishing mortality rates on Atlantic sharpnose sharks are sustainable. On the other hand, catch rates of Atlantic sharpnose sharks do not appear to be showing any signs of decline.

This action could result in continued misidentification of juvenile LCS and other shark species as Atlantic sharpnose sharks. In 1997, NMFS established an allowance for two Atlantic sharpnose sharks per person in addition to a per vessel retention limit in part because Atlantic sharpnose sharks were thought to be readily identifiable from other species due to the presence of white spots on the back. However, members of the public have raised concerns that species-specific identification continues to be a significant problem and that juvenile LCS are frequently misidentified, sometimes as Atlantic sharpnose sharks. NMFS believes that, with additional education and outreach, problems with misidentification of Atlantic sharpnose sharks can be adequately addressed.

Social and Economic Impacts

This action may have substantial social impacts for nearshore anglers by essentially establishing a catch-and-release only fishery for sharks in nearshore waters. While this action would apply to fishing within and fish from Federal waters, it may differentially impact anglers who are unable to expand their fishing into deeper waters where larger fish predominate. To the extent that anglers want to retain their catch, those anglers who cannot expand to offshore fishing would experience large reductions in their harvest levels. This action will likely have minor social impacts for offshore anglers because most of these anglers are already operating within these restrictions. However, reducing the recreational retention limit to one shark per vessel per trip will likely have substantial adverse impacts on directed pelagic fisheries as angler's willingness to pay may decline due to the reduced retention limit. As those anglers who are unwilling to accept a substitute for shark fishing will still be able to land one shark, any reduction in those angler consumer surplus may also be mitigated. Additionally, the increasing conservation ethic among anglers towards catch-and-release fishing may mitigate any adverse social impacts of this action. This action may have safety concerns for recreational fishermen who will have to determine the length of sharks relative to the minimum size.

This action may have variable economic impacts depending on the willingness of anglers to release sharks caught and substitute other fish for sharks. This action will require anglers to release most of the sharks currently caught. Fisher and Ditton (1992) note that most anglers release the fish they catch (over 70 percent of the anglers surveyed said they would be just as happy releasing the fish they caught) and that anglers spent an average of $197 per trip and were willing to spend on average an additional $105 rather than stop fishing for sharks. Fisher and Ditton (1992) also found that 32 percent of shark anglers said that no other species would be an acceptable substitute for sharks. Analyses presented to the 1998 SEW (Babcock and Pikitch, 1998) indicate that most sharks caught are released and that 63 percent of all shark recreational trips would be unaffected by a reduction in the retention limit to one shark per trip. Based on MRFSS data for 886 trips surveyed from 1994 through 1996 that caught a shark, Babcock and Pikitch (1998) estimated a minimum of $174,542 as the annual total spent by anglers who caught sharks (there may have been additional trips which targeted sharks but did not catch one), $93,030 as the annual angler consumer surplus, with a minimum of $267,572 per year as the total gross value.

While it is possible that some anglers may not pay to only catch and release or tag and release sharks, it is also possible that anglers may pay additional money for the challenge of catching a large, adult shark as opposed to the small, juvenile sharks currently caught. This is especially true in the long term as the stock rebuilds and large sharks become more abundant. Over 60 percent of those surveyed said they would rather catch one or two big fish than ten smaller fish. Also, 76 percent of those surveyed said that they fish in the saltwater for the challenge (Fisher and Ditton, 1992). Fisher and Ditton (1992) state that "shark anglers are intimately involved in fishing for big fish, and for many it is probably a central life interest." Given this evidence, NMFS does not believe a minimum size or a reduction in the retention limit would affect angler consumer surplus significantly in LCS or SCS recreational fisheries. However, since there are pelagic shark tournaments and directed pelagic shark charterboat operations, this action may reduce angler consumer surplus in those fisheries, especially for tournaments that tally the number of fish caught. In the short term, this action will allow for the continuation of current revenues to charterboat owners and captains and others who rely on the recreational shark fishery. In the long term, as shark stocks rebuild, current revenue would increase as less time would be required to catch sharks and the abundance of larger sharks increases.

Conclusion

This action is selected because it will meet NS 1 to prevent overfishing and rebuild overfished fisheries for LCS and prevent overfishing for the fully fished pelagic and SCS. Additionally, this action is selected because it implements the same minimum size for recreational and commercial shark fisheries and allows limited recreational harvest of sharks, consistent with the selected rebuilding program and NS 1, 4, and 8. Since anglers would still have the possibility of retention of a large fish, this action may mitigate social impacts relative to the rejected option to establish catch and release only fishing for all sharks.

Figure 3.5 Large coastal shark size distribution in fork length (cm) from recreational fisheries 1994 to 1996. N = 391, Mean = 80.4, Std. Mean Error = 1.85. (G. Scott, NMFS, Miami, FL, 1998)

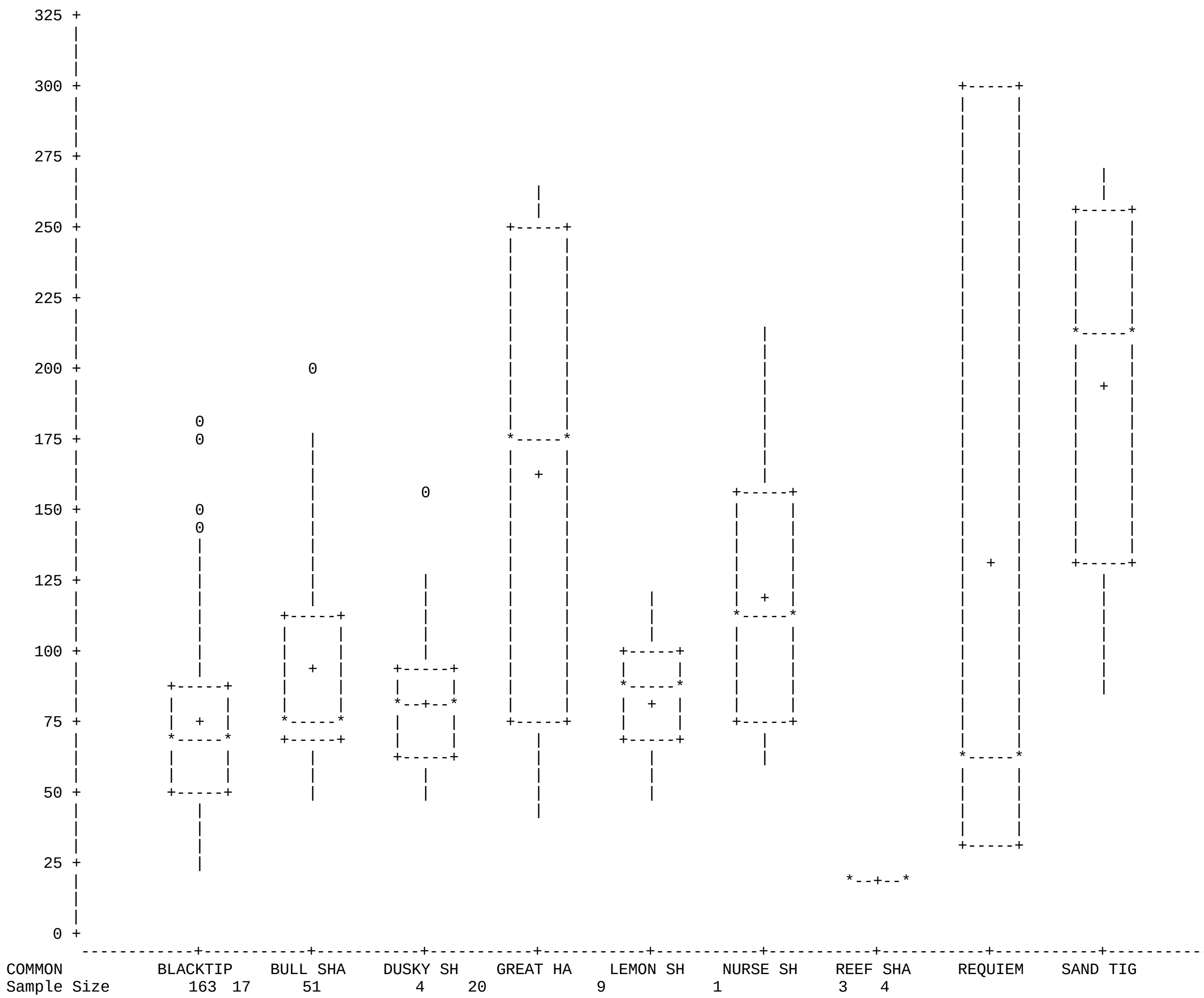
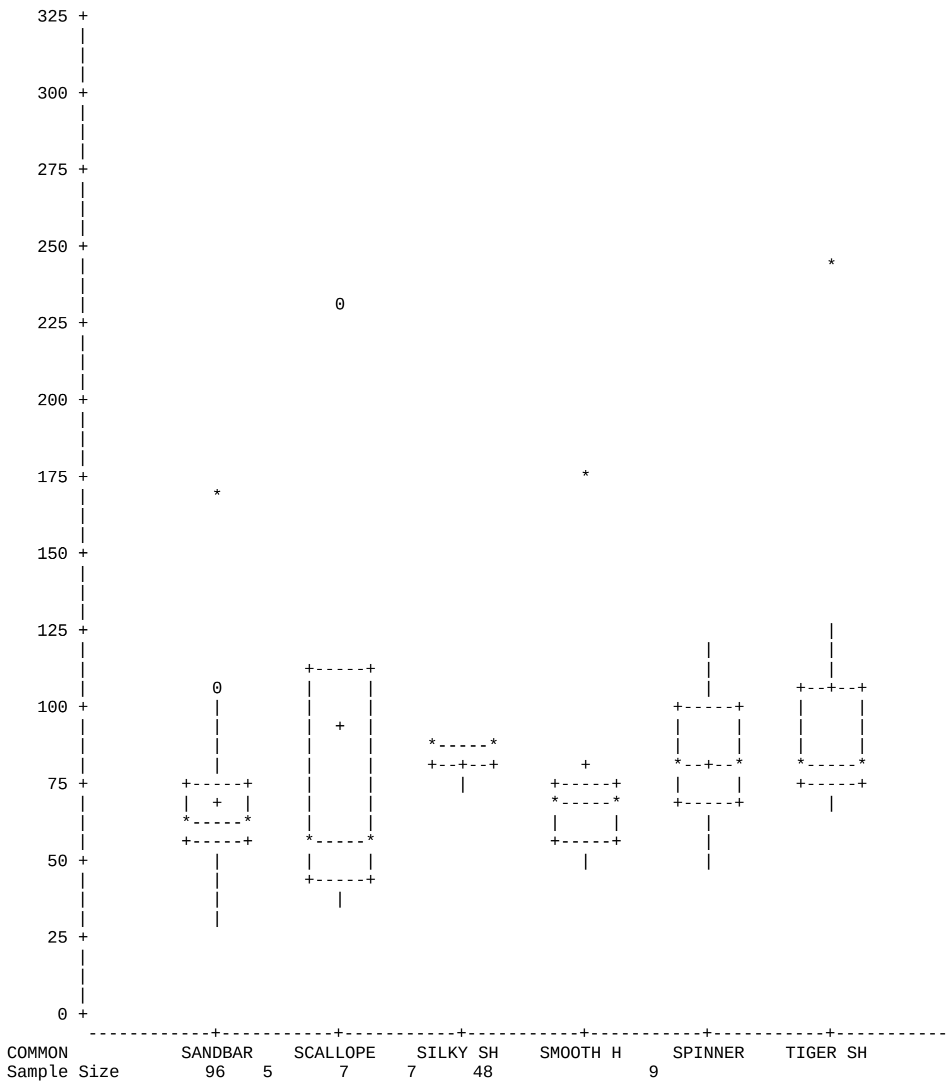


Figure 3.5 (continued)



Rejected Option: Status quo (two sharks per vessel per trip plus an allowance for two Atlantic sharpnose sharks per person per trip)

This alternative would maintain the current recreational retention limits of two sharks per vessel per trip, inclusive of LCS, pelagic sharks, and SCS. It would also maintain the allowance for two Atlantic sharpnose sharks per person per trip to accommodate charter and headboat operations.

Ecological Impacts

This alternative would result in continued LCS stock declines due to excessive harvest levels relative to the rebuilding program selected (see Table 3.11). This alternative would result in a continuing decline in LCS to one percent and seven percent of carrying capacity within ten years under the baseline and alternative catch series scenarios, respectively. There is a 98 to 100 percent probability that LCS stocks would decline to below 20 percent of carrying capacity, and a zero- to three-percent probability that LCS stocks would increase from the 1998 population levels within ten years under the baseline and alternative catch series scenarios, respectively. This alternative would not meet NS 1 to prevent overfishing and rebuild overfished fisheries.

Social and Economic Impacts

This alternative would have relatively little social impact in the short term as most anglers are already operating below these restrictions. However, in the long term, as LCS stocks continue to decline, more fishing effort will be required to find target LCS, which would likely result in reduced revenues and increased costs for charterboat and headboat operations. Angler consumer surplus may also decline for those LCS-targeted trips. The combination of a per vessel and a per person retention limit has been identified as confusing for anglers and problematic for enforcement.

Fisher and Ditton (1992) found that anglers spent an average of $197 per trip and were willing to spend on average an additional $105 rather than stop fishing for sharks. Given the fact that most anglers release the fish they catch and that the catch and release fishing ethic is growing, it is unlikely that these estimates have changed substantially since 1992. Fisher and Ditton (1992) also found that 32 percent of shark anglers said that no other species would be an acceptable substitute for sharks. In the short term, this alternative would allow for the continuation of current revenues to charterboat owners and captains and others who rely on the recreational shark fishery. In the long term, as shark stocks continue to decline, current revenue would decrease as additional time would be required to catch sharks. Eventually, revenue from shark fishing would cease.

Conclusion

This alternative is rejected because it would not meet NS1 to prevent overfishing and rebuild overfished fisheries.

Rejected Option: Reduce retention limit to one shark per vessel per trip

This alternative would reduce the per vessel limit by 50 percent. This alternative would reduce harvest levels of LCS to a maximum of one shark per vessel per trip, inclusive of ridgeback and non-ridgeback LCS, as well as all pelagic sharks and SCS.

Ecological Impacts

This alternative would not reduce the harvest of sandbar and blacktip sharks (and therefore LCS) by the necessary 82 and 81 percent in numbers of fish, respectively, relative to 1997 harvest levels (Tables 3.15 and 3.18). Analyses of the recreational fishery presented at the 1998 SEW (Babcock and Pikitch, 1998) indicate that, since most recreational LCS fishing trips currently land less than one LCS per trip, this alternative would have only a minor reduction in LCS harvest levels relative to 1997 harvest levels. Thus, this alternative would not meet NS 1 to rebuild overfished fisheries for LCS but would likely exceed the NS 1 requirement to prevent overfishing for the fully fished pelagic sharks and SCS.

Social and Economic Impacts

This alternative would likely only have minor social impacts because most recreational anglers are already operating within these restrictions. However, reducing the recreational retention limit to one shark per vessel per trip would likely have substantial adverse impacts on directed pelagic fisheries as angler consumer surplus may decline due to the reduced retention limit. The increasing conservation ethic among anglers towards catch-and-release fishing may mitigate any adverse social impacts of this alternative. As those anglers who are unwilling to accept a substitute for shark fishing would still be able to harvest one shark, any reduction in those anglers' willingness to pay may also be mitigated.

Fisher and Ditton (1992) note that most anglers release the fish they catch. Analyses presented to the 1998 SEW (Babcock and Pikitch, 1998) indicate that most sharks caught are released and that 63 percent of all shark recreational trips would be unaffected by a reduction in the retention limit to one shark per trip. Given this evidence, it is unlikely that a reduction in the retention limit would affect angler consumer surplus significantly in LCS or SCS recreational fisheries. However, since there are pelagic shark tournaments and directed pelagic shark charterboat operations, this alternative may reduce angler consumer surplus in those fisheries.

Conclusion

This alternative is rejected as a stand-alone alternative because it would not meet NS 1 to prevent overfishing and rebuild overfished fisheries.

Rejected Option: Establish an allowance for one Atlantic sharpnose shark per person per trip

This alternative would limit recreational harvest to one Atlantic sharpnose shark per person per trip. No other sharks would be authorized for retention.

Ecological Impacts

This alternative would implement catch-and-release fishing only for all sharks except Atlantic sharpnose sharks and would require all other sharks to be released in a manner that maximizes the probability of survival. This alternative would result in the fastest rebuilding to maximum sustainable yield levels for LCS by reducing effective fishing mortality to post-release mortality only. Assuming a low post-release mortality, this alternative would be expected to provide high probability that LCS stocks will increase from the 1998 levels (Tables 3.11, 3.14, and 3.17). This alternative would be expected to meet NS 1 to prevent overfishing and rebuild overfished fisheries for LCS, and would also enhance stock status for the fully fished pelagic and small coastal sharks.

Reducing the allowance of Atlantic sharpnose sharks per person from two to one would likely have moderate ecological impacts as most anglers currently harvest less than two Atlantic sharpnose sharks per trip. This alternative for Atlantic sharpnose sharks would be a precautionary measure to increase the probability that any shifts in recreational fishing effort and harvest away from the overfished LCS to Atlantic sharpnose sharks are sustainable. However, pending additional scientific evaluation, it cannot be determined whether current or reduced fishing mortality rates on Atlantic sharpnose sharks are sustainable. On the other hand, catch rates of Atlantic sharpnose sharks do not appear to be showing any signs of decline.

This alternative could also result in misidentification of juvenile LCS and other shark species as Atlantic sharpnose sharks. In 1997, NMFS established an allowance for two Atlantic sharpnose sharks per person in addition to a per vessel retention limit in part because Atlantic sharpnose sharks were thought to be readily identifiable from other species due to the presence of white spots on the back. However, members of the public have raised concerns that species-specific identification continues to be a significant problem and that juvenile LCS are frequently misidentified, sometimes as Atlantic sharpnose sharks. NMFS intends to develop an identification guide to address this concern and to increase public education and awareness.

Social and Economic Impacts

This alternative may have substantial social impacts by eliminating landings of all sharks except Atlantic sharpnose sharks. This alternative would eliminate the opportunities for trophy and tournament anglers to bring in their catches and may significantly reduce an angler consumer surplus if only Atlantic sharpnose sharks can be retained. Additionally, directed pelagic shark fisheries would become essentially catch and release only fisheries. The adverse social impacts of this alternative may be reduced to the extent that there is a growing public opinion that catch-and-release fishing is the preferable recreational fishery for sharks.

This alternative would likely have similar economic impacts to those described under establish catch and release only fishing in that the impacts would depend on the willingness for shark anglers to substitute other fish and release sharks caught, especially for tournament participants who would be unable to harvest any trophy fish and for directed pelagic shark fishery participants. Given that shark anglers do not necessarily fish in order to obtain a trophy or for consumption, this alternative may only result in minor reductions in angler consumer surplus.   However, angler consumer surplus may be reduced at the tournament level, in directed pelagic shark fisheries, and in fisheries whose participants are unwilling to substitute Atlantic sharpnose shark fishing as their only shark fishing activity.

Conclusion

This alternative is rejected as a stand-alone alternative because the final action is expected to moderate the social and economic impacts while still meeting conservation objectives.

Rejected Option: Establish a minimum size of 4.5 feet FL (137 cm FL) for all sharks

This alternative would restrict recreational landings of all sharks to those greater than 4.5 feet FL (equivalent to 137 cm FL). It would essentially create catch and release only fishing for all sharks less than 4.5 feet FL.

Ecological Impacts

This alternative would establish the same minimum size for the recreational fishery that is implemented in the commercial ridgeback LCS fishery, with the exception that the minimum size for the recreational fishery would apply to all sharks and not a subgroup. The rationale for this alternative follows that for the final action in that post-release mortality of sharks caught in recreational fisheries is believed to be relatively low. A minimum size of 4.5 feet for all sharks would greatly reduce the effective fishing mortality on the most sensitive stages/sizes by essentially implementing catch-and-release fishing on juvenile and subadult sharks. According to MRFSS data, approximately 95 percent of LCS harvested in 1997 were below the selected minimum size (Figure 3.5). Therefore, this alternative could reduce the number of LCS harvested by more than the 82 percent necessary under the selected LCS rebuilding program.

However, this alternative would not limit the quantity of sharks that could be harvested on a given trip and so, as a stand-alone alternative, a minimum size may actually allow for expansion of harvest levels, contrary to the reductions needed for rebuilding. Additionally, significant recreational fisheries for sharks exist in nearshore waters and coastal bays and estuaries which are important pupping and nursery areas for juvenile and subadult stages/sizes. Many of these areas have been identified as essential fish habitat. One potential drawback with a minimum size in nearshore waters may result if increased fishing effort is directed towards pregnant females as they enter the pupping grounds in coastal bays and estuaries. Additional management measures, such as male only harvest, may be warranted in such circumstances.

This alternative, though primarily intended as a LCS rebuilding measure, would also affect pelagic and SCS fisheries. Recreational fishing for SCS would be essentially catch-and-release fishing only under this alternative because some SCS like Atlantic sharpnose and bonnethead sharks do not reach 4.5 feet (137 cm FL) at full maturity. However, SCS are often caught incidentally to other recreational fishing operations such that this alternative is unlikely to affect the primary targets of those operations. On the other hand, substantial recreational fisheries target pelagic sharks, especially shortfin mako, thresher, and blue sharks. However, implementing a 4.5 feet FL minimum size would have relatively minor ecological impacts because most of the pelagic sharks currently retained exceed 4.5 feet FL. To the extent that this alternative supports voluntary restrictions on harvest of juvenile and subadult sharks, faster rebuilding may result.

Social and Economic Impacts

This alternative may have substantial social impacts by essentially establishing a catch-and-release fishery for sharks in nearshore waters. While this alternative would apply to fishing within and fish from Federal waters, it may differentially impact anglers who are unable to expand their fishing into deeper waters where larger fish predominate. To the extent that anglers want to retain their catch, those anglers who cannot expand to offshore fishing would experience large reductions in their harvest levels. However, the increasing conservation ethic among anglers towards catch-and-release fishing may mitigate any adverse social impacts of this alternative. This action may have safety concerns for recreational fishermen who would have to determine the length of sharks relative to the minimum size.

This alternative may have variable economic impacts depending on how willing anglers are to release sharks caught and substitute other fish. Under this alternative, anglers would be forced to catch and release most of the sharks currently caught. However, there is evidence that anglers already do this voluntarily (Fisher and

Ditton, 1992; Babcock and Pikitch, 1998). Fisher and Ditton (1992) found that over 70 percent of the anglers surveyed said they would be just as happy releasing the fish they caught (rated as "agree" and "strongly agree"). However, it is possible that some anglers may not pay to only catch and release or tag and release sharks. Fisher and Ditton (1992) found that 51 percent of the anglers surveyed said that the more fish they catch (but not necessarily land), the happier they are. It is also possible that anglers may pay additional money for the challenge of catching a large, adult shark as opposed to the small, juvenile sharks currently caught. This is especially true in the long term as the stock rebuilds and large sharks become more abundant. Over 60 percent of those surveyed said they would rather catch one or two big fish than ten smaller fish (Fisher and Ditton, 1992). Also, 76 percent of those surveyed said that they fish in the saltwater for the challenge (Fisher and Ditton, 1992). Fisher and Ditton (1992) state that "shark anglers are intimately involved in fishing for big fish, and for many it is probably a central life interest." Given this evidence, NMFS does not believe a minimum size would decrease angler consumer surplus. In fact, it may even increase it over the long term.

Conclusion

This alternative is rejected as a stand-alone alternative because the final action is expected to mitigate the social and economic impacts while still meeting conservation objectives.

Rejected Option: Catch-and-release only recreational fishing for sharks

This alternative would implement catch-and-release fishing only for all recreational shark fisheries, inclusive of all LCS, pelagic sharks, and SCS. This alternative would require all sharks to be released in a manner that maximizes the probability of survival.

Ecological Impacts

This alternative would result in the fastest rebuilding to maximum sustainable yield levels by reducing recreational fishing mortality to post-release mortality only. As no quantitative estimates for post-release mortality of sharks caught in recreational fisheries (in general or for individual species) are currently available, only qualitative impacts can be discussed at this time. However, assuming a low post-release mortality, this alternative would be expected to provide for the fastest rebuilding possible with high probabilities that LCS stocks will increase from the 1998 levels. This alternative would be expected to meet NS 1 to prevent overfishing and rebuild overfished fisheries for LCS, and would also enhance stock status for the fully fished pelagic and small coastal sharks.

Social and Economic Impacts

This alternative would have substantial social impacts by eliminating recreational harvests of all sharks. This alternative would eliminate the opportunities for trophy and tournament anglers to bring in their catches and may significantly reduce an angler's willingness to pay if no sharks can be retained. This alternative may be perceived as "unfair" to recreational fishing interests if the commercial fishery is allowed to continue. It is important to note that this alternative would not prevent anglers from fishing and gaining the benefits of the fishing experience but it would prevent anglers from retaining any of their catch. The adverse social impacts of this alternative may be reduced to the extent that there is a growing public opinion that catch-and-release fishing is the preferable recreational fishery for sharks.

This alternative also depends on the willingness for shark anglers to substitute other fish and release sharks caught. Therefore, this alternative will have similar, but slightly higher, impacts as those discussed under minimum sizes. This is especially true as tournaments would be unable to harvest any trophy fish. Fisher and Ditton (1992) found that 27 percent of the anglers surveyed fish in order to obtain fish for eating and 18 percent fish in order to obtain a trophy. Given the evidence that shark anglers do not necessarily fish in order to obtain a trophy or for consumption, it is unlikely this alternative would reduce angler consumer surplus or the willingness to pay significantly for private vessels. However, angler consumer surplus may be reduced at the tournament level, in directed pelagic shark fisheries, and in those fisheries whose participants are unwilling to substitute fishing for species other than sharks.

Conclusion

This alternative is rejected as a stand-alone alternative because the final action is expected to mitigate the social and economic impacts while still meeting conservation objectives.

Rejected Option: Establish catch and release only recreational fishing for LCS and SCS and establish a retention limit of one pelagic shark per vessel per trip

Ecological Impacts

This alternative would establish catch and release only recreational fishing for all LCS and SCS, and would reduce the recreational retention limit for pelagic sharks to one fish per vessel per trip. The rationale for this alternative follows from those for the preceding alternatives in that it constitutes a combination of catch and release only fishing for all LCS and SCS and a reduced retention limit for pelagic sharks. This alternative would reduce the recreational retention limit on pelagic sharks by 50 percent and would reduce recreational fishing mortality on LCS and SCS to post-release mortality only. Because post-release mortality of sharks is believed to be low but is currently unknown, this alternative would meet the reduction needed under the selected rebuilding program while accounting for post-release mortality. This alternative would be expected to result in the fastest rebuilding to maximum sustainable yield levels for LCS with high probability that LCS stocks would increase from the 1998 levels. This alternative would be expected to meet NS 1 to rebuild overfished fisheries for LCS, and may prevent overfishing for the fully fished pelagic and small coastal sharks.

Social and Economic Impacts

As with the ecological impacts, the social impacts of this alternative are likely to be a combination of those discussed under the preceding alternatives. This alternative would be likely to have substantial social impacts because the pelagic shark retention limit would be reduced such that the pelagic shark tournaments would be restricted to one pelagic shark per vessel per trip and would be unable to harvest any LCS or SCS. It is important to note that this alternative would not prevent anglers from fishing and gaining the benefits of the fishing experience. The adverse social impacts of this alternative may be reduced to the extent that there is growing public opinion that catch-and-release fishing is the preferable recreational fishery for sharks.

The economic impacts of this alternative would depend on the willingness for shark anglers to substitute other fish and release sharks caught, especially for tournament participants who would be unable to harvest any trophy LCS and would be restricted to one pelagic shark per vessel per trip. Given that shark anglers do not necessarily fish in order to obtain a trophy or for consumption, this alternative may only result in minor reductions in angler consumer surplus. However, since many tournaments target pelagic sharks for which the retention limit would be reduced, angler consumer surplus at the tournament level may be reduced substantially. This alternative would establish a catch-and-release fishery for all LCS and SCS and would likely differentially impact anglers and the recreational communities if shark anglers are unable, or unwilling, to expand their fishing into offshore waters where pelagic sharks predominate. To the extent that anglers want to retain their catch, those anglers who cannot expand to offshore fishing or substitute other species would experience large reductions in their harvest levels.

The combination of a per vessel and a per person retention limit has been identified as confusing for anglers and problematic for enforcement. This alternative would establish catch and release only fishing for all LCS and SCS in part due to the difficulties in enforcement of the current regulations and due to continued, widespread misidentification of juvenile LCS and SCS.

Conclusion

This alternative is rejected because of substantial social and economic impacts, and because the final action is expected to meet rebuilding goals while reducing social and economic impacts.

3.4.2.3.3 Recreational Landing Condition for Sharks

Previous Atlantic shark regulations did not stipulate any landing condition requirements for recreational fishermen. The Atlantic shark regulations do stipulate that commercial permit holders cannot fillet a shark at sea, which means that sharks can be headed, gutted, and finned but the carcass must be landed with the flesh attached. This stipulation for the commercial fishery was implemented to improve dockside identification of sharks to the species level.

NMFS received comments that requiring recreational anglers to keep sharks intact while allowing commercial fishermen to head and fin sharks is unfair. These comments warrant further consideration. However, NMFS adopts the requirement for recreational fishermen to keep sharks intact while not imposing a new requirement for commercial fishermen at this time. When the Shark FMP was implemented in 1993, commercial fishermen were allowed to remove and discard heads, tails, and fins and to fillet the sharks at sea to allow more of the available vessel hold capacity to be used for storing the shark carcasses that eventually would be sold. A commercial landing prohibition on filleting sharks at sea was implemented in 1997 in order to increase species-specific of carcasses at the dock. The basis for this provision may have changed, but additional public discussion is needed before the regulations are modified. While NMFS strives for consistent regulations for all user groups, concerns about quality and safety of seafood sold for public consumption resulting from inadequate freezing of shark carcasses preclude a similar regulation for commercial shark fisheries at this time. Because individual recreational shark fishermen harvest smaller quantities of sharks per trip and take shorter fishing trips relative to commercial operations, recreational fishermen should be able to adequately ice shark carcasses so as not to compromise seafood safety. Requiring recreational fishermen to keep sharks intact will address continued widespread problems with species-specific identification of sharks in recreational fisheries.

Final Action: Require that all sharks harvested by recreational fishermen have heads, tails, and fins attached

This action requires all sharks that are harvested by recreational fishermen have the heads, tails, and fins attached to the carcass. Anglers may still gut and bleed the carcass by making an incision at the base of the caudal peduncle as long as the caudal tail is not removed. Filleting sharks at sea is prohibited.

Ecological Impacts

This action has minimal ecological impacts in that no changes in fishing effort or distribution would be expected as result of this requirement. This action will greatly facilitate dockside species-specific identification of shark harvest for monitoring, management, and enforcement purposes. To the extent that this requirement facilitates stock assessments, this action will enhance rebuilding and species-specific management.

Social and Economic Impacts

This action should have minimal social impacts because it will not preclude anglers from bleeding those sharks retained for personal consumption (necessary to prevent spoilage of the meat), and those anglers who desire to have their catch mounted will not be impacted. This action will establish different regulations between the commercial and recreational fishing communities and may contribute to a sense of "unfairness" in terms of regulatory burden. To the extent that this requirement facilitates species-specific identification of retained sharks, this action will have positive social impacts by enhancing stock assessments and species-specific management.

This action should have little economic impact. Anglers could still bleed and eviscerate sharks for consumption. To the extent that it supports stock assessments, this measure will allow more species-specific and less restrictive management in the future.

Conclusion

This action is selected due to the enhancement of dockside identification of sharks at the species level and decreased enforcement costs, which will facilitate species-specific stock assessments and management. NMFS may consider carcass landings restrictions in commercial fisheries to address problems with species-specific identification of sharks in those fisheries in the future.

Rejected Option for Recreational Landing Condition for Sharks

Rejected Option: Status quo (no landing condition requirements; recreationally landed sharks can be headed, gutted, finned, and filleted at sea)

This alternative would not establish a landing condition requirement for recreationally harvested sharks. Sharks harvested by recreational anglers could continue to be headed, gutted, finned, and filleted at sea.

Ecological Impacts

This alternative would have no direct ecological impacts. However, to the extent that problems with species-specific identification continue to confound stock assessments and management, this alternative would have negative ecological impacts.

Social and Economic Impacts

To the extent that problems with species-specific catch and effort data from recreational fisheries confound stock assessments and management, this alternative would contribute to the need for broad-brush management, which may result in more restrictive management measures than might otherwise be possible. Additionally, disparate regulations between the commercial and recreational fishing communities may contribute to a sense of "unfairness" in terms of regulatory burden. This alternative would be expected to have no additional economic impacts because anglers are already operating under this provision.

Conclusion

This alternative is rejected because of the need to improve species-specific identification of sharks in recreational fisheries.

3.4.2.3.4 Prohibition on Finning of Sharks

NMFS prohibited the practice of finning (removing the fins of a shark and discarding the carcass) as part of the original Atlantic Shark FMP in 1993. As stated in the 1993 FMP "the U.S. public has decried this practice, perceiving it as wasteful and cruel" (p.74). Prior to the original 1993 FMP, the practice of finning was common due to the extremely high commercial value of the fins and the comparatively low value of the meat (currently, average prices for fins are $11.67 per pound whereas the average price for meat is $0.58, $0.55, and $1.21 per pound for LCS, SCS, and pelagic sharks, respectively).

Previously, the Atlantic shark regulations prohibited the finning of sharks in the management unit only (the 39 species to which Federal regulations applied). There was no prohibition on finning of sharks outside of the Federal management unit (approximately 34 species), creating a significant enforcement burden to verify species-specific identification of shark fins through DNA testing.

Final Action: Create new management group of deepwater/other sharks (formerly data collection only) and establish a prohibition on finning for this management group

This action creates a new management group of deepwater and other shark species found in the U.S. Atlantic E.E.Z. (species formerly included in the 1993 Shark FMP for data collection only) and establishes a prohibition on finning as the only regulation for the deepwater/other shark management group at this time. These deepwater/other species are not subject to the permit and reporting requirements, retention and size limits, or quotas established in the FMP. NMFS may consider additional management measures for this group in the future.

Ecological Impacts

To the extent that Federal shark permit holders are finning shark species outside of the Federal management unit (LCS, pelagic sharks, and SCS only), this action will eliminate that waste and contribute to rebuilding or maintenance of those species. This action will also enhance enforcement capabilities by removing a costly and time-consuming administrative burden of verifying species-specific identification of shark fins through DNA testing, and therefore ensure compliance with the prohibition on finning on all sharks.

Social and Economic Impacts

This action may decrease net revenues for those fishermen who rely on revenue from the fins (not the meat) of sharks outside the Federal management unit. This action may also increase fixed costs if fishermen need to provide additional freezer space for species normally finned and discarded; however, estimates of any such cost increases are unavailable at this time.

Conclusion

This action is selected because it will greatly enhance enforcement capabilities and contributes to the rebuilding or maintenance of shark species formerly unregulated by reducing any waste from finning. This action is also selected due to the additional benefits of including these species into the Federal management unit and thereby establishing regulatory authority should additional management measures be necessary in the future. NMFS intends to evaluate the biological condition of the stocks in the deepwater/other group and may consider additional management measures in conjunction with the HMS AP following the framework procedure described in Section 3.10.

Rejected Option for Prohibition on Finning of Sharks

Rejected Option: Status quo - shark finning prohibited in the Federal management unit of the Atlantic ocean

This alternative would not establish a deepwater/other management group, would maintain the current prohibition on finning of the 39 LCS, pelagic sharks, and SCS only, and would not extend that prohibition to all shark species found in the U.S. EEZ.

Ecological Impacts

To the extent that Federal shark permit holders are finning shark species outside of those in the Federal management unit, this alternative would allow that waste to continue.

Social and Economic Impacts

This alternative would not be expected to have additional social and economic impacts because fishermen are already operating under this restriction.

Conclusion

This alternative is rejected because of significant enforcement costs and the greater benefits of establishing a deepwater/other species group into the Federal management unit and thereby establishing regulatory authority should additional management measures be necessary in the future.

Rejected Option: Extend prohibition on finning to all sharks as condition of Federal permit

This alternative was the preferred alternative in the draft HMS FMP and would link the prohibition on finning to the Federal commercial shark permit. As a condition of receiving the permit, Federal shark permit holders would agree that they would not fin any sharks, regardless whether such sharks are defined as part of the Federal management unit or are subject to any Federal regulations. This alternative is similar to the final action but limits the prohibition on finning to Federal commercial shark permit holders only. Non-Federally permitted commercial fishermen and recreational fishermen would not be affected by this alternative.

Ecological Impacts

To the extent that Federal shark permit holders are finning shark species outside of those in the Federal management unit, this alternative would eliminate that waste and contribute to rebuilding or maintenance of those species. This alternative would enhance enforcement capabilities by removing a costly and time-consuming administrative burden of verifying species-specific identification of shark fins through DNA testing.

Social and Economic Impacts

This alternative may decrease net revenues for those fishermen who rely on revenue from the fins (not the meat) of sharks outside the management unit. This alternative may also increase fixed costs if fishermen need to provide additional freezer space for species normally finned and discarded, however, estimates of any such cost increases are unavailable at this time.

Conclusion

This alternative is rejected because there are greater benefits from including all sharks in the management unit.

3.4.2.3.5 Directed Large Coastal Shark Commercial Retention Limit

Since the original FMP was implemented in 1993, the LCS directed commercial fishery has experienced severe derby fishing conditions. Such conditions often result in fishermen fishing further inshore than they normally do in order to minimize transit time from fishing grounds to offloading sites. Fishing in inshore areas where immature sharks predominate can have several negative ecological ramifications including higher catches of immature fish and associated higher effective fishing mortality rates, increased bycatch rates of undersized fish if a minimum size is implemented, and higher fishing effort (with increases in bycatch of immature fish) because more small fish than large fish must be caught to reach the same weight-based quota. Due to the implementation of minimum size, it is likely that fishing effort will be shifted further offshore where larger fish predominate; however, as derby fishing conditions persist, the incentive to minimize transit time and fish inshore will continue as well.

In 1994, in an attempt to prolong the fishing seasons and reduce derby conditions, NMFS implemented a 4,000-pound retention limit in the LCS fishery. As a result of the reduced profitability of trips under this retention limit, many of the large fishing vessels left the LCS fishery. On a given trip, fishermen that reach the 4,000-pound LCS retention limit in mid-haulback must cut off the remaining gear and return to shore. Once unloaded, the fisherman may return to collect the remaining gear. This practice can result in delays of a few days in collecting all the gear as well as lost gear and higher mortality of species, including juvenile sharks, sea turtles, and other finfish, than if the gear had been collected all at once.

Final Action: Status quo (4,000 pounds dw per trip retention limit for directed LCS fisheries)

This action maintains the directed LCS commercial retention limit of 4,000 pounds dw. No retention limits exist for the directed commercial pelagic shark or SCS fisheries although retention limits for all species are established for incidental shark permit holders under the limited access system (see Chapter 4 for more details).

Ecological Impacts

This action, in combination with limited access, will help ensure that derby fishing conditions do not worsen. To the extent that reduced quotas will increase derby fishing conditions, the commercial retention limit will help extend the season and mitigate a worsening of the derby. Because this action will not eliminate the "race for fish," bycatch catch rates and post-release survival concerns may continue to be a lower priority in determining fishing practices and areas than catching the most fish on a given trip.

Social and Economic Impacts

This action may not have additional economic impacts because directed LCS fishermen are already operating under this restriction. It will continue to extend the LCS fishery by reducing the amount of fish that can be landed on a given trip but will help ensure that the instability and unpredictability of the LCS fishery does not increase.

Conclusion

This measure is selected because of concerns that derby fishing conditions and associated safety problems would worsen and bycatch and bycatch mortality rates would increase if the directed LCS retention limit were increased or eliminated. Additionally, the economic advantages of extending the LCS fishing season are expected to outweigh the possible increased profitability of individual LCS trips.

Rejected Options for Directed Large Coastal Shark Commercial Retention Limits

Rejected Option: Decrease directed LCS commercial retention limit to 2,000 pounds dw

This alternative would decrease the directed LCS commercial retention limit of 4,000 pounds dw by 50 percent to 2,000 pounds dw.

Ecological Impacts

This alternative may lengthen the LCS fishing seasons and may mitigate derby fishing conditions. To the extent that this alternative reduces derby fishing conditions, bycatch and bycatch mortality rates of immature or undersize sharks and other regulatory or market-driven discards may decrease if these concerns were given higher priority in determining fishing practices and areas than catching the most fish on a given trip.

Social and Economic Impacts

This alternative may have some positive social and economic impacts by extending the fishing seasons, decreasing the severity of market gluts, and mitigating derby fishing conditions relative to the 4,000 pound retention limit. However, this alternative may decrease the profitability of individual shark trips to offset the costs of fishing by increasing fuel and labor costs as well as the chances for lost gear from an increased number of trips. Decreased profitability of trips may result in fishermen who were operating at the margin under the 4,000-pound retention limit leaving the fishery or worsened derby fishing conditions from fishermen trying to make up for increased costs. However, annual gross revenues for smaller vessels that may be operating at the margin may increase because a lower retention limit may result in larger vessels exiting the fishery.

Conclusion

This alternative is rejected at this time because of the uncertainty of the impacts of decreasing the retention limit on derby fishing conditions, safety at sea, and bycatch and bycatch mortality rates. While this FMP implements limited access for the Atlantic shark fishery and is expected to alleviate some derby fishing conditions, the actual level of that reduction is not known at this time. NMFS intends to reevaluate possible changes in the directed LCS retention limit once the impacts of limited access are better known.

Rejected Option: Increase directed LCS commercial retention limit to 6,000 pounds dw

This alternative would increase the directed LCS commercial retention limit of 4,000 pounds dw by 50 percent to 6,000 pounds dw.

Ecological Impacts

This alternative would likely shorten the LCS fishing seasons and thereby worsen derby fishing conditions. This alternative would likely increase bycatch and bycatch mortality rates of immature or undersize sharks and other regulatory or market-driven discards as these concerns would be a lower priority in determining fishing practices and areas than catching the most fish on a given trip.

Social and Economic Impacts

This alternative would likely increase the instability and unpredictability of the LCS fishery by shortening the fishing seasons and worsening derby fishing conditions relative to the 4,000-pound retention limit. This alternative may also attract larger fishing vessels due to possible increased profitability on a given trip, thereby further exacerbating derby fishing conditions and safety concerns. Implementation of a limited access or individual quota system that would significantly alleviate derby fishing conditions may warrant further consideration of increasing or eliminating the commercial LCS retention limit.

This alternative may improve the profitability of individual shark trips. By increasing the retention limit, directed LCS fishermen would be allowed to bring in additional sharks and thus offset the cost of fishing. This alternative may also decrease the cost of shark fishing by decreasing the chances for lost gear; however, this alternative also has negative impacts. By increasing the retention limit, the length of the LCS season would likely be decreased, increasing the severity of market gluts and derby fishing conditions. Also, annual gross revenues for smaller vessels that may be operating at the margin would likely decline because the retention limit would allow relatively more of the quota to be harvested by larger vessels. Any increase in gross revenues for these larger vessels could be offset by decreasing ex-vessel prices due to market gluts. An increased retention limit could also attract larger vessels back into the fishery, provided they are willing to obtain a limited access permit, which could remove profits from directed LCS fishermen.

Conclusion

This alternative is rejected at this time because of concerns that derby fishing conditions would worsen, safety at sea would decrease, bycatch and bycatch mortality rates would increase, and because the economic advantages of extending the LCS fishing season are expected to outweigh the possible increased profitability of individual LCS trips. Additionally, while this FMP implements limited access for the Atlantic shark fishery and is expected to alleviate some derby fishing conditions, the actual level of that reduction is not known at this time. NMFS intends to reevaluate possible changes in the directed LCS retention limit once the impacts of limited access are better known.

Rejected Option: Eliminate the directed LCS commercial retention limit

Under this alternative, directed LCS fishermen would be unrestricted in the amount of LCS landed on any given trip during the open season for LCS.

Ecological Impacts

This alternative would significantly shorten the LCS fishing seasons and thereby worsen derby fishing conditions. As discussed above, this alternative would likely greatly increase bycatch and bycatch mortality rates of immature or undersized fish and other regulatory or market-driven discards as these concerns continue to be a lower priority in determining fishing practices and areas than catching the most fish on a given trip. To the extent that the LCS fishing season would be closed for a much longer time, bycatch and bycatch mortality rates may actually decline if bycatch rates during the open season were not too high.

Social and Economic Impacts

This alternative would likely greatly increase the instability and unpredictability of the LCS fishery by dramatically shortening the fishing seasons and worsening derby fishing conditions. This alternative could also attract larger fishing vessels due to increased profitability on a given trip, thereby further exacerbating derby fishing conditions and safety concerns. Implementation of a limited access or individual quota system that would significantly alleviate derby fishing conditions may warrant further consideration of increasing or eliminating the directed commercial LCS retention limit.

This alternative would likely improve the profitability of a portion of individual shark trips. By eliminating the directed LCS retention limit, fishermen would be allowed to bring in unlimited quantities of shark per trip and thus offset the cost of fishing, especially since the costs of lost gear would be greatly reduced. This alternative would also have significant negative impacts, however. By eliminating the directed LCS retention limit, the length of the LCS season would likely be substantially decreased, increasing the severity of market gluts and derby fishing conditions. Also, annual gross revenues for smaller vessels that are operating at the margin would likely decline because derby-style fishery would allow relatively more of the quota to be harvested by larger vessels. Any increase in gross revenues for these larger vessels could be offset by decreasing ex-vessel prices due to market gluts. Additionally, eliminating the directed LCS retention limit could attract larger vessels back into the fishery, provided they are willing to obtain a limited access permit, which may remove profits from current shark fishermen.

Conclusion

This alternative is rejected due to increased bycatch and bycatch mortality rates, worsened derby fishing conditions and safety at sea, increased instability in the LCS fishery, and expectations that the majority of directed LCS fishermen would experience substantially reduced annual gross revenues. Limited access is expected to alleviate some derby fishing conditions and NMFS intends to reevaluate possible changes in the directed LCS retention limit once the impacts of limited access are better known.

3.4.3 Authorized Gears

3.4.3.1 Atlantic Tunas

Final Action: Prohibit driftnet gear in the Atlantic tunas fisheries, maintain status quo for other Atlantic tunas gear types

This action removes driftnets as an authorized gear type in the Atlantic tunas fisheries. North Atlantic swordfish were the primary Atlantic highly migratory species targeted using driftnets, although the use of driftnets in the Atlantic swordfish fishery was banned by NMFS in January 1999. There is little information available about pelagic driftnetting for Atlantic tunas since there have been few directed sets on tunas. No directed tuna driftnet fishery was known to exist until two “swordfish driftnet” vessels used driftnet gear in 1997 to target tuna species, resulting in a high rate of deaths of marine mammals. In 1998, one vessel made two trips targeting tuna species using driftnet gear. The driftnet used was of a smaller mesh size (six-inch stretch) than that commonly used for swordfish (18 to 22 inch). Preliminary information on the two trips indicates that, while few tuna were caught on the first 1998 trip (only one set made), a substantial amount was landed on the second trip (three sets made). There were no mammal or turtle takes on the first trip, and one common dolphin was taken on the second trip. These protected species takes are lower than rates commonly seen in the swordfish driftnet fishery; however, the driftnet trips targeting tuna in 1997 did have high takes and this gear is known for its high takes of protected species.

Species of tuna caught incidentally by driftnet vessels targeting swordfish include skipjack, albacore, yellowfin, and bigeye tuna. These tunas range in size, and dealers indicate that driftnet-caught tunas tend to be lower quality than longline-caught tunas because of damage from the fishing net. When sets are specifically targeted at tuna with swordfish driftnet gear, it appears that turtle and marine mammal takes are similar to those in which swordfish are targeted, provided the same gear is used in the same general areas and seasons. According to the 1997 Biological Opinion issued by the NMFS Office of Protected Resources, a directed tuna driftnet fishery would be required to have 100 percent observer coverage and a time/area closure in order to avoid jeopardy of taking a northern right whale.

There is also a coastal driftnet fishery which lands Atlantic tunas (mostly west Atlantic skipjack and north Atlantic albacore tuna, as well as Atlantic bonito and little tunny). This fishery primarily targets bluefish and weakfish in the summer and fall, off the coasts of southern New England and the mid-Atlantic. From the data available, approximately 20 vessels using this type of gear landed Atlantic tunas in 1996 and 1997 (see Chapter 2).

This final action prohibits the use of all driftnet gear in the Atlantic tunas fisheries. However, vessels using driftnet gear when targeting species other than Atlantic tunas may apply for an Experimental Fishing Permit (EFP) to land incidentally caught Atlantic tunas (other than bluefin). A condition of the EFP will be that the vessels must submit information about their catch and effort to NMFS.

Other than prohibiting the use of driftnets, this alternative maintains the status quo for other geartypes in the Atlantic tunas fishery. However, as part of the regulatory consolidation for HMS, begun by NMFS in 1996 and completed with this FMP, certain minor administrative and technical changes were made to the regulations. These changes include redefinition of the incidental catch permit category for Atlantic tunas. The Incidental category is now split into "Longline" and "Trap" categories, and fixed gear other than traps and purse seines for non-tuna fisheries are no longer allowed to land bluefin tuna.

Ecological Impacts

The Marine Mammal Protection Act (MMPA) requires NMFS to calculate the potential biological removal level for each marine mammal stock that may be seriously injured or killed by commercial fishing activities. A primary goal of the MMPA is to ensure that the level of marine mammals killed or seriously injured by commercial fishing activities is reduced to the potential biological removal level to ensure these stocks remain healthy. In 1998, the driftnet fishery for Atlantic swordfish opened August 1 and closed August 14. Driftnet vessels landed approximately two-thirds of their swordfish quota of 91,711 pounds, and also took 34 endangered or threatened sea turtles, including two green turtles, five leatherback turtles, and 27 loggerhead turtles along with 293 whales, dolphins and other marine mammals. In the 1998 Atlantic swordfish driftnet fishery, the potential biological removal level was exceeded for beaked whales and common dolphins. When driftnet sets are specifically targeted at tuna, it appears that takes are similar to those in which swordfish are targeted, provided similar gear is used in the same general areas and seasons. Any future trips taken by driftnet vessels targeting tunas pose a threat to endangered and threatened turtles, and strategic stocks of marine mammals.

Several Atlantic tunas are overfished (bigeye tuna, north Atlantic albacore tuna, and west Atlantic bluefin tuna) and the potential for an increased driftnet tuna fishery risks additional mortality on these stocks. There are many New England and mid- Atlantic gillnet vessels whose fishing is limited by effort controls such as days-at-sea restrictions, seasonal closures, and retention limits. These vessels use driftnets (for groundfish, dogfish, monkfish, etc.) with mesh sizes similar to those used by the vessel targeting tunas in 1998, and may easily convert to fish for tunas during times when they are restricted from fishing for their usual targeted species. NMFS is concerned about the potential effort which could be directed at tunas which could result in increased mortality on fully fished and overfished species.

Social and Economic Impacts

While there is no established driftnet fishery for Atlantic tunas, prohibiting the use of this gear type would prevent any future directed effort on the over- or fully-fished BAYS tunas. In 1992 to 1995, an average of 5.74 tunas (other than bluefin tuna) were caught per set by driftnets targeting swordfish, and most of these tunas were retained and sold. However, since NMFS has banned the use of driftnets in the Atlantic swordfish fishery, the income generated by these sales of incidental catches of tuna has already been eliminated. Vessels using coastal driftnets may continue to land and sell Atlantic tunas caught incidentally while targeting other species, if they apply for and are issued an Experimental Fishery Permit.

Conclusion

This is the final action. Pelagic driftnets have been shown to have high bycatch of finfish and protected species (Cramer, 1996). Allowing development of a new directed fishery for fully fished Atlantic tuna stocks, particularly when other stocks in the target complex are overfished, is not consistent with the precautionary approach to fisheries management, nor with the objectives of this FMP to build sustainable HMS fisheries. Furthermore, allowing development of a new fishery with a gear that has been demonstrated to have high bycatch rates would not support achievement of NS 9, nor would it support objectives of this FMP to minimize bycatch and bycatch mortality. NMFS has not identified any significant safety implications associated with this action.

Final Action: Status quo authorized gear for swordfish

In January 1999, NMFS prohibited the use of driftnets in the Atlantic swordfish fishery. There are no other expected changes to authorized gears in this fishery. Directed gears remain: pelagic longline, rod and reel, handline, and harpoon. In addition to these gears that are also authorized in the Incidental fishery(with the exception of Harpoon), squid trawls may land swordfish as incidental catch subject to retention limits (see Section 3.4.2.2.2). There are not expected to be any ecological impacts of this status quo, other than those described in Section 3.5, outlining bycatch with each of these gear types. There are no social or economic impacts or safety issues associated with this alternative.

Final Action: Status quo authorized gear for sharks: (A) for the hook and line fishery: rod and reel, handline, and bandit gear; (B) for the longline fishery: longline gear; (C) for the drift gillnet fishery: gillnet gear

On June 4, 1998 (63 FR 30455), NMFS published a proposed rule to establish a list of fisheries and allowable fishing gear and, specific to Atlantic shark fisheries, the proposed list of authorized fisheries and gears included: 1) rod and reel, handline, and bandit gear (for the hook and line fishery); 2) longline gear (for the longline fishery); 3) gillnet gear (for the drift gillnet fishery); and 4) harpoon gear (for the harpoon fishery).

On January 27, 1999 (64 FR 4030) NMFS finalized the list of authorized gears and, specific to the shark fishery, removed the harpoon gear from the final list of authorized gears due to the lack of historical landings as well as the fact that the only two species readily available to harpoon gear are the whale and basking sharks, both of which are prohibited species. This action maintains all the fisheries and gear types as finalized on January 27, 1999. This action maintains the only current gear restriction of a maximum length restriction of 2.5 kilometers for drift gillnets.

Ecological Impacts

In the absence of other new management measures, this action allows the bycatch rates and mortality in all authorized fisheries and gears, including the southeast drift gillnet shark fishery, to continue. However, the final action that requires 100 percent observer coverage in the southeast drift gillnet shark fishery will ensure that any bycatch and bycatch mortality is fully monitored and documented (see Section 3.5). To the extent that such bycatch rates and mortality keep overfished species from rebuilding or contribute to excessive fishing mortality on other species, this alternative would have negative ecological impacts.

Social and Economic Impacts

This action is the status quo and is not expected to have additional social or economic impacts because fishermen are already operating under these restrictions. Several states are making efforts to reduce drift gillnet bycatch and bycatch mortalities of juvenile sharks, sea turtles, and other valuable finfish. This action will maintain enforcement costs and the administrative costs of observer coverage and fishery monitoring.

Conclusion

This action is selected because, in combination with the final actions to adopt the Atlantic Large Whale Take Reduction Plan regulations and to require 100 percent observer coverage in the southeast drift gillnet shark fishery, concerns regarding high bycatch and bycatch mortality rates of marine mammals, sea turtles, and finfish in that fishery will be addressed.

NOTE: There are inconsistencies between the final rule governing the List of Fisheries and Gear under the Magnuson-Stevens Act (64 FR 4030), the Atlantic Large Whale Take Reduction Plan regulations under the Marine Mammal Protection Act (64 FR 7529), and the proposed rule to implement the HMS FMP (64 FR 3154) regarding use of strike nets in the shark drift gillnet fishery. NMFS will address these inconsistencies through future regulatory and other actions.

Rejected Options for Authorized Gears

Rejected Option: Status quo authorized gear for tuna

Before the implementation of this FMP, the authorized gears in the Atlantic tuna fisheries were: rod and reel, handline, harpoon, bandit gear, and purse seine nets. Driftnets were also allowed for tunas other than bluefin. Incidental catches of bluefin tuna were allowed for vessels fishing with longlines, purse seine nets targeting herring and menhaden, fixed gear, and traps. This alternative would maintain this status quo for authorized gear types in the Atlantic tuna fishery.

Ecological Impacts

The ecological impacts of the status quo can be found in the Description of Fisheries section of the FMP (Chapter 2), as well as the Social Impact Assessment (Chapter 9). The impacts of allowing the use driftnets for Atlantic tunas (other than bluefin) are also described in the Final Action above.

Social and Economic Impacts

This alternative would not be expected to have any additional social or economic impacts because fishermen are already operating under these measures. There are no significant safety implications associated with this alternative.

Conclusion

This alternative is rejected in favor of the Final Action above.

Rejected Option: Allow spearguns as an authorized gear in the Atlantic tunas fishery

This alternative would add spearguns to the list of authorized gears in the Atlantic tunas fishery. At the 1993 public hearings on the proposed list of authorized gears in the Atlantic tuna fishery, no comments were received from spear fishermen and the regulations were made final without listing spear guns as an authorized gear. Since implementation of the final rule on authorized gear types in the bluefin tuna fisheries, NMFS has received several written requests and presentations at AP meetings to authorize spear fishing gear for the Atlantic tunas fisheries. Several spearfishermen expressed an interest in participating in the winter bluefin fishery in North Carolina. Under this alternative, speargun fishermen would be permitted in either the Angling category or the Charter/headboat category.

Ecological Impacts

Given the quota system in place for bluefin tuna, this alternative would not result in additional bluefin tuna landings. The potential increase in landings for other Atlantic tunas would be minimal compared with the landings by current participants. This is underscored by public comment and written comments submitted to NMFS from spearfishermen that suggest that fewer than twenty fishermen would be expected to use this gear type. Furthermore, many speargun fishermen have reported to NMFS at public meetings that they expect encounter rates with the target species to be very low, and that an individual fisherman could expect to fish for months or years without catching a tuna. However, west Atlantic bluefin tuna and most other Atlantic tunas are already overfished or fully-fished, and allowing new gear types and fisheries for these species would not be consistent with NMFS' objective to rebuild overfished stocks and prevent overfishing of healthy stocks, and other measures in this FMP to control fishing effort and limit gear types. There are also concerns that allowing spearguns to be used in the Atlantic tunas fishery would increase discards. These concerns stem from the fact that some fish which are speared may free themselves of the dart, but would most likely be mortally wounded.

Social and Economic Impacts

The economic impacts of allowing spearguns as an authorized gear type would likely be minimal. Allowing bluefin tuna to be caught with spearguns under the Angling category quota would reduce the amount of quota available for rod and reel anglers, which could result in reduced angler consumer surplus for the recreational sector. This could be offset by added angler consumer surplus for spearfishermen.

Atlantic bluefin tuna and most other Atlantic tunas are subject to intense competition between user groups. Allocating bluefin tuna quota for an additional gear type could result in increased competition for a fishery which already has excess capacity relative to its quota. When the issue of spearguns was discussed by the HMS AP, panel members and members of the public expressed safety concerns about rod and reel vessels and divers fishing in the same area. Due to certain "Rules of the Road" for navigation, divers must be given a wide berth at sea, and this raises safety issues due to potential gear conflicts between the recreational/commercial fleets and the spearfishermen, particularly during the North Carolina winter fishery for bluefin tuna. However, spearfishermen contest that because they must be able to surface quickly while freediving, and because of the danger of gear entanglement, divers would not fish in the same areas as rod and reel or longline vessels.

Conclusion

This alternative is rejected. As mentioned above, allowing new gear types and fisheries for these species would not be consistent with objectives to rebuild overfished stocks and to prevent overfishing. NMFS has recently denied petitions or requests for additional allowable gear types and fisheries for Atlantic tunas on these grounds (i.e., pair trawls and commercial handgear in the North Carolina winter fishery for bluefin tuna). The addition of spearguns as an authorized gear type in the Atlantic tuna fishery could also increase user group conflict and safety concerns. The HMS AP heard comments from the public at multiple meetings, and discussed the issue without reaching consensus.

3.4.4 Fishing Year

The following alternatives consider implications of changing the fishing year in HMS fisheries. Alternatives relating to the scheduling of the fishing year are not likely to have significant safety implications, however, ecological, social, and economic impacts are discussed below.

Final Action: Fishing year begins June 1 and Ends May 31 for tuna and swordfish; fishing year begins January 1 and ends December 31 for sharks

Each November, the United States participates in negotiations at ICCAT to manage the tuna, swordfish, and billfish fisheries. In the following months, NMFS issues regulations or takes other action to implement ICCAT recommendations. As part of the rulemaking process, it may be necessary to conduct analyses, draft regulations and accompanying documents, and hold a series of public hearings, before an ICCAT recommendation can be implemented. A SAFE report will be prepared annually in January/February and AP meetings may also be necessary. It is difficult to complete these tasks thoroughly in sufficient time for fishery participants to be aware of how the regulations may change for the upcoming fishing year, particularly if the fishing year commences almost immediately after the ICCAT meeting (January 1). This action shifts the start of the fishing year for tunas to June 1, giving both NMFS and fishery participants adequate time to develop and consider conservation and management measures that will implement ICCAT recommendations effectively. Since sharks are not currently subject to ICCAT management authority, the calendar year is maintained.

Ecological Impacts

This action is not expected to have any ecological impacts. It should not necessarily change the time of the year or the areas in which HMS are caught. For bluefin tuna, the General and Harpoon category seasons will still open June 1 of each year, and the Purse Seine category will open August 15 and run through December 31 or until the quota is landed. For tunas other than bluefin, Purse Seine vessels may fish from June 1 through December 31, as long as they have bluefin quota remaining.

Social and Economic Impacts

This action is expected to have positive social and economic impacts on participants in the Atlantic tunas fisheries. It will allow fishery participants more time to plan their fishing activities, and thus should lend more predictability to fishing-dependent business and income.

Conclusion

NMFS will implement this final action, based on the management considerations outlined above. This action has no significant safety implications. Although NMFS will continue to report calendar year data to ICCAT for the purposes of stock assessment, fishing year data will be used to determine the United States' compliance with ICCAT quotas.

Rejected Options for the Fishing Year

Rejected Option: Status quo fishing year

Under this alternative, the fishing year for sharks and Atlantic tunas would remain January 1 through December 31. The swordfish fishing year would remain June 1 through May 31. For Atlantic tunas, the General and Harpoon categories do not open until June 1, and the Purse Seine category does not open until August 15, but the "fishing year" ends December 31 for these categories as well.

Ecological Impacts

The shark fishing year is split into two semi-annual seasons, January 1 through June 30 and July 1 through December 31. The quota is split evenly between the semi-annual seasons, and this FMP authorizes NMFS to deduct quota overharvests and add quota underharvests from one semi-annual season from the quota for the same semi-annual season the following year. Prior to this FMP, overharvests or underhavests could not be carried across fishing years.

The north Atlantic swordfish fishing year is currently split into two semi-annual seasons, June 1 through November 31 and December 1 through May 31. The longline/ harpoon quota is split evenly between the seasons with an annual Incidental catch quota. NMFS may deduct quota overharvests and add quota underharvests to the following fishing year or semi-annual season, whichever is reasonable (i.e., deduct first semi-annual overharvest from second semi-annual season, deduct second semi-annual season overharvest from following fishing year). SCRS assessments are completed and new TAC and other measures are recommended by ICCAT in November, allowing time to implement management measures prior to the start of the following fishing year on June 1.

The fishing year for Atlantic tunas begins January 1, although the General and Harpoon fisheries for bluefin tuna open June 1, and the Purse Seine fishery for bluefin tuna opens August 15. The Angling, Longline, and Trap categories do open on January 1, and the ICCAT schedule makes it difficult to implement ICCAT recommendations by the start of the fishing year.

Social and Economic Impacts

Without sufficient time to implement ICCAT recommendations before the start of the fishing year for some fisheries, it can be difficult for fishermen to plan, and participate in the process of implementation of ICCAT recommendations.

Conclusion

This alternative is rejected. The fishing years for HMS start at different times of the year, causing confusion when referring to fishing years, especially those fisheries subject to ICCAT management authority. In addition, it is difficult for NMFS to implement ICCAT recommendations for tunas in time for the January 1 fishing year since the ICCAT meeting is in November. There are no significant safety implications associated with this alternative.

3.5 A Strategy for Bycatch Reduction in HMS Fisheries

3.5.1 Introduction

Bycatch has become a central concern of fishing industries, resource managers, scientists, and the public, both nationally and globally. A 1994 report of the Food and Agriculture Organization (FAO) of the United Nations estimated that the nearly one-quarter (27 million metric tons) of the total world catch by commercial fishing operations was discarded (Alverson *et al.*, 1994). Bycatch from recreational fisheries was not quantified in the FAO report, but anglers also discard (dead and alive) millions of fish each year. Bycatch can result in death or injury to the discarded fish, and it is essential that this component of total fishing-related mortality be incorporated into fish stock assessments and evaluation of management measures.

Bycatch precludes other more productive uses of fishery resources; it is particularly important to minimize the waste associated with bycatch when so many of the world's fisheries are either fully exploited or overexploited. Although not all discarded fish die, when bycatch becomes a source of fishing mortality it can slow the rebuilding of overfished stocks. Bycatch imposes direct and indirect costs on fishing operations by increasing sorting time and decreasing the amount of gear available to catch target species. Bycatch concerns also apply to populations of marine mammals, sea turtles, seabirds and other components of ecosystems for which there are no commercial or recreational uses.

In 1998, NMFS developed a national bycatch plan, *Managing the Nation's Bycatch* (NMFS 1998c), which includes programs, activities, and recommendations for federally managed fisheries. That plan establishes a definition of bycatch as fishery discards, retained incidental catch, and unobserved mortalities resulting from a direct encounter with fishing gear. The Magnuson-Stevens Act defines bycatch as fish which are harvested in a fishery, but which are not sold or kept for personal use, and includes economic and regulatory discards. NMFS bases all bycatch discussions in this FMP on the Magnuson-Stevens Act definition of bycatch. In this FMP, NMFS responds to recommendations made by the NMFS bycatch plan by seeking to improve data on the character and magnitude of bycatch in HMS fisheries, funding research on gear deployment methods, working cooperatively with the fishing industry, and reducing bycatch of tunas and undersized swordfish. This section of the FMP, provides a bycatch reduction strategy for Atlantic HMS fisheries (tunas, sharks, and swordfish). Bycatch in the billfish fishery is addressed in Amendment One to the Atlantic Billfish FMP (NMFS, 1999a), although measures to reduce billfish bycatch will likely be implemented in HMS regulations/amendments.

3.5.1.1 Bycatch Reduction and The Magnuson-Stevens Act

National Standard 9 requires that fishery conservation and management measures shall, to the extent practicable, minimize bycatch and minimize the mortality of bycatch that cannot be avoided. In many fisheries, it is not practicable to eliminate all bycatch and bycatch mortality. The Magnuson-Stevens Act defines bycatch as:

> fish that are harvested in a fishery, but are not sold or kept for personal use, and includes economic discards and regulatory discards. [Bycatch] does not include fish released alive under a recreational catch and release fishery management program.

Some relevant examples of fish that are included in the Magnuson-Stevens Act's definition of bycatch are Atlantic billfish caught and discarded by commercial fishing gear (unless they are tagged and released alive); undersized swordfish and BAYS tunas caught and discarded by recreational or commercial fishermen; species for which there is little or no market and are therefore discarded, such as blue sharks; and most sharks that are not landed (including fish hooked and lost, or fish released at the boat - whether or not the fish was tagged). A recreational catch and release fishery management program is one in which the retention of a particular species caught with recreational fishing gear is prohibited (National Standard Guidelines, 63 FR 24235; May 1, 1998).

Some relevant examples of fish that would not be considered bycatch are white sharks caught in recreational fisheries because that fishery is, by regulation, a catch and release fishery only, and billfish and tunas that are caught, tagged, and released by commercial fishing vessels. This provision applies to billfish and bluefin tuna that are caught by longline vessels and released alive under the Southeast Fisheries Science Center's Cooperative Tagging Center.

NMFS recognizes that recreational anglers have voluntarily reduced landings of Atlantic billfish since the 1988 Atlantic Billfish FMP, by relying heavily on catch and release. Including Atlantic billfish that are recreationally caught and voluntarily released by recreational fishermen in the definition of bycatch is counterproductive because release of a live fish is a beneficial event. Each released fish provides multiple recreational opportunities and social and economic benefits without adversely impacting the stocks, if and only if the probability of surviving catch and release is high. Based on fishing and handling techniques currently used by recreational anglers, the survival rate of billfish is probably in excess of 90 percent. Scientific studies summarized in Sections 3.4.1 and 3.5.2.2 of the Amendment One to the Atlantic Billfish FMP corroborate this estimate of release survival.

Therefore, NMFS is encouraging further catch and release of Atlantic billfish by establishing a recreational catch-and-release fishery management program. The following factors support establishment of a catch-and-release program in the recreational Atlantic billfish fishery: 1) the exclusively recreational nature of the directed Atlantic billfish fishery; 2) the already-existing high rate of release of live fish in this recreational fishery; 3) the high rate (likely in excess of 90 percent) of survival of recreationally caught-and-released fish; and 4) the high economic benefit of each fish caught. Further, NMFS believes that establishing a catch-and-release fishery in this situation will further foster the already existing catch-and-release ethic of the recreational billfish fishermen, thereby increasing release of billfish caught in this fishery. Through this program, recreational billfish catch and release is not bycatch. NMFS will work with the Advisory Panels to consider such an approach for other highly migratory species.

NMFS has evaluated all final actions in this FMP in terms of their effect on the amount and type of bycatch according to the following criteria: impacts on affected stocks; incomes accruing to participants in the directed fisheries in both the short and long term; incomes accruing to participants in fisheries that target the bycatch species; environmental consequences; non-market values of bycatch species, which include non-consumptive use and existence values; and impacts on other marine organisms. NMFS has also analyzed the extent to which further reductions in bycatch are practicable, taking into account the following factors: effects on the populations of bycatch species; potential effects on other species in the ecosystem, including marine mammals, sea turtles, and birds; changes in fishing and marketing costs; changes in fishing practices; effects on research, administration, and enforcement costs; impacts on management effectiveness; effects on safety at sea; changes in the economic, social, or cultural value of fishing activities and non-consumptive uses of fishery resources; changes in the distribution of benefits and costs; and social impacts.

There are many benefits associated with the reduction of bycatch, including the reduction of uncertainty concerning total fishing-related mortality, which improves NMFS' ability to assess the status of stocks, to determine the appropriate optimum yield, and to ensure that overfishing levels are not exceeded. NMFS recognizes that it is also important to consider bycatch of HMS as a source of mortality, especially sharks, from fisheries that target species other than HMS (e.g., shrimp trawl and menhaden purse seine fisheries). To support rebuilding overfished stocks and maintain sustainable fisheries, NMFS is committed to working with fishery constituents on an effective, flexible bycatch strategy. This strategy includes a combination of management measures in the domestic fishery, and if appropriate, will consider multi-lateral measures at ICCAT and other international fora (e.g., FAO Shark Global Plan of Action). The bycatch in each fishery will be summarized annually in the SAFE report for HMS fisheries. NMFS will evaluate the effectiveness of the bycatch reduction measures based on this summary. Any regulatory changes will be made using the framework in Section 3.10.

A limited number of tools are currently available for bycatch reduction in HMS fisheries, all of which are being used. There are probably no fisheries in which there is no bycatch because none of the currently legal fishing gears are perfectly selective for the target of each fishing operation (with the possible exception of the swordfish harpoon fishery). Therefore, to eliminate bycatch of every species in HMS fisheries would require eliminating fishing. That is unrealistic, unnecessary, and inconsistent with the intent of the Magnuson-Stevens Act. So, the challenge becomes one of managing the kinds of gear, their configuration, and how, when, and where they are operated; and the disposition of each species caught in such a way that the unintended catch is reduced, the survival of the catch is maximized, and the sustainable use of bycatch is achieved where appropriate. HMS fisheries are currently limited to the following gear types: rod and reel and other handgear, longline, purse seine, and harpoon for tunas; handgear, longline, squid trawl, and harpoon for swordfish; and handgear, longline, drift gillnet, and rod and reel for sharks. Recent attempts to introduce new fishing gears that also have bycatch have not succeeded (e.g., pair trawls). Some gear has recently been prohibited (swordfish driftnets), and this FMP prohibits driftnets used for tunas and focuses additional data collection on shark drift gillnets. Possible gear modifications that may reduce bycatch and bycatch mortality are being researched and considered (e.g., circle hooks).

Managing when and where fisheries operate is an effective tool for reducing bycatch. Recent attempts to close critical habitats to protect fish from directed and incidental fishing gear have been successful. Closures have been implemented in Oculina Banks, in the Flower Garden Sanctuary, and in reef fish stressed areas. Additional time/area closures are being implemented in this FMP and even more will be considered in 1999 through frameworking.

The sustainable use of bycatch species may encourage fishermen to retain such species. Often, catch is discarded in a fishery because of undesirable species, size, sex, or quality, or for other reasons, including economic discards (e.g., blue sharks). If certain species could be marketed, then they would be retained, not discarded, and therefore would not be considered bycatch.

3.5.1.2 Bycatch Reduction and the Marine Mammal Protection Act

The Marine Mammal Protection Act of 1972 is the principal Federal legislation that guides marine mammal species protection and conservation policy. Under requirements of the MMPA, NMFS produces an annual List of Fisheries that classifies domestic commercial fisheries, by gear type, relative to their rates of incidental mortality or serious injury of marine mammals. The List of Fisheries includes three classifications:

- Category I fisheries are those with frequent serious injury or mortality to marine mammals (pelagic longline);
- Category II fisheries are those with occasional serious injury or mortality (shark drift gillnet); and
- Category III fisheries are those with remote likelihood of serious injury or mortality to marine mammals (shark bottom longline, charterboat rod and reel, purse seine, harpoon).

Fishermen participating in Category I or II fisheries are required to be registered under the MMPA and if selected, to accommodate an observer aboard their vessels (Table 3.27). Vessel owners or operators, or fishermen, in the case of nonvessel, in Category I, II, or III fisheries must report all incidental mortalities and injuries of marine mammals during the course of commercial fishing operations to NMFS Headquarters. There are currently no regulations requiring recreational fishermen to report takes, nor are they authorized to have incidental takes (i.e., they are illegal). NMFS does require reporting and authorizes takes by charter/headboat fishermen (considered "commercial" by the MMPA), however, no reports have been submitted to NMFS to date.

In 1995, the reauthorization of the MMPA established the Take Reduction Team process which allows development of Take Reduction Plans for Category I and II fisheries. Take reduction teams are made up of individuals who represent the span of interests affected by the strategies to reduce takes, including commercial and recreational fishing industries, fishery management councils, interstate commissions, academic and scientific organizations, state officials, environmental groups, Native Alaskans or other Native American interests, if appropriate, and NMFS representatives. The immediate goal of a take reduction plan is to reduce, within six months of its implementation, the incidental take of affected marine mammal stocks to below their potential biological removal levels. The long-term goal of a take reduction plan is to reduce, within five years, the incidental take of marine mammals to insignificant levels approaching zero mortality and serious injury rates. Take Reduction Plans are adopted by consensus and forwarded to the Secretary of Commerce with recommendations for implementation. Take reduction teams relevant to HMS fisheries include the Atlantic Offshore Cetacean Take Reduction Team (developed to address takes by pelagic longline, pelagic driftnet, and pair trawls) and the Atlantic Large Whale Take Reduction Team (developed to address takes by shark drift gillnets, among other gears.)

Table 3.27 Reporting Requirements of the MMPA

Category I Fisheries (frequent serious injury or mortality to marine mammals)	**Category II Fisheries** (occasional serious injury or mortality to marine mammals)	**Category III Fisheries** (remote likelihood of incidental mortality or serious injury to marine mammals)
Pelagic Driftnet and Pelagic Longline Fisheries	Shark Drift Gillnet Fishery	Shark Bottom Longline, Purse Seine, Commercial Rod and Reel, Harpoon Fisheries
• must report all incidental mortalities and injuries of marine mammals during the course of commercial fishing operations to NMFS Headquarters	• must report all incidental mortalities and injuries of marine mammals during the course of commercial fishing operations to NMFS Headquarters	• must report all incidental mortalities and injuries of marine mammals during the course of commercial fishing operations to NMFS Headquarters
• must be registered under the MMPA	• must be registered under the MMPA	
• must, upon request, accommodate an observer aboard their vessels	• must, upon request, accommodate an observer aboard their vessels	
• must comply with any implementing regulations of applicable take reduction plans	• must comply with any implementing regulations of applicable take reduction plans	

3.5.1.3 Bycatch Reduction and the Endangered Species Act

The Endangered Species Act (ESA) is the primary federal legislation governing interactions between fisheries and species whose continued existence is threatened or endangered. Through a consultative process, the ESA allows federal agencies to evaluate proposed actions in light of the impacts they could have on these ESA-listed species. In the case of marine fisheries, NMFS Office of Sustainable Fisheries consults with the Office of Protected Resources to determine what impacts major fishery management actions will have on endangered populations of marine species and what actions can be taken to reduce or eliminate negative impacts. Under the consultative process, NMFS issues a Biological Opinion which outlines expected impacts of the proposed action and specifies terms and conditions which must be met to mitigate impacts on ESA-listed species.

In the recent past, NMFS has been operating under conditions of a Biological Opinion/Incidental Take Statement that include reasonable and prudent measures for avoiding the likelihood of placing an endangered species in jeopardy.

Some requirements of the Biological Opinion that may have regulatory implications include :

- five percent observer coverage for pelagic longline vessels under stratified random sampling scheme;
- 100 percent observer coverage for shark drift gillnets during right whale season;
- Educational workshops for vessel operators;
- A workgroup to evaluate potential management actions to reduce sea turtle takes;
- Distribute turtle release techniques;
- Evaluate observer coverage for adequacy of protected resources;
- Implement limited access; and
- Assess the potential use of VMS in the shark drift gillnet fishery.

Under the terms of the Incidental Take Statement, a fishery is limited to the following sea turtle takes. A "take" does not imply a dead turtle, rather an interaction of any sort with a sea turtle. The incidental take levels will be based on an annual estimated number:

Pelagic Longline Fishery

- 690 leatherback turtles entangled or hooked, of which no more than 11 are observed hooked by ingestion or moribund when released.
- 1541 loggerhead turtles entangled or hooked, of which no more than 23 are observed moribund when released.
- 46 green turtles entangled or hooked, of which no more than two are observed hooked by ingestion or moribund when released.
- 23 Kemp's ridley turtles entangled or hooked, of which no more than one is observed hooked by ingestion or moribund when released.

Shark Drift Gillnet Fishery (annual estimated number)

- 20 loggerhead turtles
- 2 leatherback turtles
- 2 Kemp's ridley turtles
- 2 green turtles
- 2 hawksbill turtles

3.5.2 Evaluation and Monitoring of Bycatch

The identification and quantification of bycatch in HMS fisheries is the first step in reducing bycatch and bycatch mortality. The Magnuson-Stevens Act requires the amount and type of bycatch to be summarized in the annual SAFE reports.

Pelagic longline dead discards for swordfish, billfish, large coastal sharks and pelagic sharks are estimated using data from NMFS observer reports and pelagic logbook reports. (For more information, see Cramer and Adams, 1998a). Coastal driftnet and shark drift gillnet discards will be estimated using logbook data for the annual SAFE report.

There is concern about the accuracy of discard estimates in the rod and reel HMS recreational fishery due to the low number of observations by the Large Pelagic Survey. These bycatch estimates (expanded based on observations and total fishing effort) are not currently available, except for bluefin tuna in 1997. For some species, encounters are considered rare events which might result in bycatch estimates with considerable uncertainty. Bycatch estimates of rod and reel data can also be estimated using tournament reports.

NMFS has not estimated swordfish harpoon bycatch estimates. NMFS has limited observer data on harpooned swordfish from driftnet trips in which harpoons were sometimes used. However, swordfish harpoon fishermen are required to submit pelagic logbooks and NMFS will examine those data for use in estimating bycatch. NMFS has not estimated bluefin tuna harpoon bycatch estimates because these tuna fishermen have not been selected to submit logbooks. NMFS has not estimated bycatch in the General category commercial rod and reel bluefin tuna fishery although anecdotal evidence indicates that undersized bluefin tuna may be captured. Studies of release mortality are ongoing.

The following table summarizes currently available information regarding bycatch in HMS fisheries. Data regarding the catch of HMS in other fisheries are sparse and will be addressed on a limited basis in this document. NMFS continues to assemble existing data on the incidental catch of HMS (particularly for sharks) in other fisheries, and to initiate new measures that require monitoring of their effects on bycatch mortality stock-wide (e.g., measures such as prohibiting species and implementing minimum sizes for sharks).

Table 3.28 Available Data Regarding Bycatch in HMS Fisheries (based on NMFS, 1998c)

Gear Type	Database	Bycatch data available ?	Bycatch per unit effort data available ?	Discards	Ability to Assess Magnitude of Bycatch[1]	Bycatch and Bycatch Mortality Data Collection Changes in this FMP
Pelagic Longline	Pelagic Logbook Observer database	Yes	Yes (per set or by # of hooks)	Finfish Marine mammals Sea turtles Sea birds	3	None*
Bottom Longline (sharks)	Snapper-Grouper Logbook Pelagic Logbook Observer database	Yes	Yes (per set)	Finfish Sea Turtles	3	None
Coastal Driftnet	Multispecies Logbook Observer database	Yes	Yes	Finfish Marine mammals Sea birds	2	None
Shark Drift Gillnet	Trent *et al* study (1993-1995) Observer database (beginning 7/1/98)	Yes	Yes (per set)	Finfish Marine mammals Sea turtles	2	None
Purse Seine	Observer database (1996 only)	Yes	Yes (per set)	Finfish (predominantly tunas) Marine Mammals	2	None[2]
Commercial BAYS Tunas	None	No	No	Unknown	0 ➜2[3]	Require logbook reporting for Charter vessels[2]
Harpoon (bluefin tuna and swordfish)[4]	None	No	No	*Anecdotal: undersized BFT*	2	None[2]
Recreational HMS	Tournament database Tagging program LPS (June-Nov., VA-ME); MRFSS (April-Oct, ME-TX)	Yes (finfish only)	Yes (per trip)	Finfish	1➜2	Require Charter/headboat reporting, tournament reporting form (NMFS is authorized to select charter vessels for logbook reporting and all recreational tuna vessels for observer reporting)

[1] The quality of discard information was evaluated for each fishery using a 4-point scale where 0=no information available; 1= unverified harvester or incidental observer reports; 2= isolated snapshots from observer programs; 3= estimation of discards possible with limitations on precision and accuracy; and 4=estimates available with adequate precision and accuracy.

[2] NMFS is authorized to select these vessels for observer coverage

[3] The arrow indicates that the current ability increased as a result of final actions in this FMP

[4] Harpooned swordfish that are sold are indicated on the pelagic logbook. However, these fish have been frequently harpooned on driftnet or pelagic longline vessels and logbook discard information does not attribute discards to a specific gear type if multiple gears are on board.

3.5.2.1 Bycatch of HMS in All Fisheries

As west Atlantic bluefin tuna, bigeye tuna, north Atlantic albacore, north Atlantic swordfish, and large coastal sharks are overfished, NMFS particularly seeks to limit bycatch mortality on these stocks. Bycatch can occur in any HMS fishery, commercial or recreational. The magnitude and the composition of such bycatch is dependent on the gear type, and fishing technique and season.

Bycatch of Bluefin Tuna

In 1996, ICCAT recommended that the United States adopt measures designed to reduce *discards* of west Atlantic bluefin tuna in 1997 and1998. At its 1998 meeting, ICCAT modified that language to recommend that all Contracting Parties, including the United States, minimize *dead discards* of bluefin tuna *to the extent practicable*. NMFS has considered numerous options to respond to the 1996 and 1998 ICCAT recommendations to minimize *discards*. The focus of the analyses and policy considerations has been on pelagic longlines since this gear type is responsible for the majority of dead discards reported by the United States to ICCAT. NMFS is also interested in quantifying bycatch of bluefin tuna in the purse seine, harpoon, and rod and reel fisheries and is currently authorized to place observers on these vessels in order to collect necessary catch and effort information.

NMFS provides annual estimates of landings and dead discards of bluefin tuna in the National Report to ICCAT. The dead discard estimates are almost exclusively for pelagic longline gear. Total longline dead discards, for both the NW Atlantic and the Gulf of Mexico have decreased from 142 mt in 1995, to 73 mt in 1996, to 37 mt in 1997. Estimates of bluefin tuna discards from the pelagic longline fishery were based on dockside interviews expanded to landings for time-area strata for which data were available (primarily the southeastern United States). From 1987 through 1991, bluefin tuna discard estimates for U.S. pelagic longline gear were made by multiplying 1) logbook information on the ratio of bluefin tuna total catch (landings plus discards) to the logbook reported landings of large pelagic species by 2) the dockside information of landings of those same species. Subsequently, it was observed that the former estimation procedure resulted in estimates that were virtually identical to tallies of discards in the logbook reports, so NMFS is now using a simple tabulation of reported discards (for number of fish discarded), using average weights from observer data.

In 1996 and 1997, both logbook and observer data were used in this fashion to tabulate longline bluefin tuna discards. Bluefin tuna dead discards by pelagic longline vessels declined 48 percent in 1996 from 1995, and an additional 50 percent in 1997. These reductions are due, in part, to reductions in quotas for the fisheries in which these dead discards occur (i.e., the shark quota was reduced by 50 percent in 1997, and the swordfish quota has been reduced by 30 percent from 1992 to 1998). Despite the recent decline of bluefin tuna discards from the U.S. longline fleet, discards of bluefin tuna continue to occur. Tagging studies of HMS released from pelagic longline gear have not provided data on survival rates due to many factors involved in preventing reporting of recaptured fish, for instance, long migration distances may imply international recaptures.

Recently, NMFS has begun to collect and analyze discard data from other gear types. Dead discard data reported to ICCAT in 1996 included 4 mt of driftnet bluefin tuna dead discards, and 1997 data included estimates of rod and reel dead discards (14.6 mt). Observers on purse seine vessels in 1996 did report several bluefin tuna discards, but it generally could not be determined whether the fish were alive or dead (there were no observers on purse seine vessels in 1997 or 1998). Discard data are generally unavailable for several other fisheries, including the harpoon fishery. Logbooks from the reef fish and grouper-snapper fisheries were also reviewed in 1996 and 1997, but no bluefin tuna discards were reported. NMFS is exploring options for improving monitoring and reporting of bluefin tuna dead discards from all gear types. It is important to recognize that when comparing past estimates of dead discards reported to ICCAT to future estimates for detecting trends, the past estimates have, for the most part, only included dead discards from pelagic longlines. For example, it would be inappropriate to conclude that dead discards have not changed if the total estimate of dead discards were to remain at the same level, when the new estimate may include additional gear types. Refer to Table 3.48 for a summary of reported dead discards, quotas and landings of bluefin tuna for 1992 through 1997, as reported to ICCAT in the 1997 and 1998 National Reports of the United States to ICCAT.

Many constituents believe that large numbers of bluefin tuna discards are a result of the regulations governing this fishery and that NMFS and the United States can alleviate these discards by changing the regulations. Longline dead discards, although documented and reported to ICCAT, do not currently count against the overall landing quota allocated to the Longline category or to the United States, although they are incorporated into stock assessments and are taken off the overall Total Allowable Catch before landings quotas are allocated at ICCAT. The 1998 ICCAT recommendation for west Atlantic bluefin tuna establishes a dead discard allowance of 79 mt for the west Atlantic, 68 mt of which was allocated to the United States. The 1998 ICCAT recommendation also provides that if a nation exceeds its discard allowance in one year, that nation must deduct the excess from its following year's landing quota. If the actual amount of dead discards is less than the allowance, one-half of the difference may be added to the allocation of catch that can be retained.

U.S. regulations prohibit directed fishing on bluefin tuna with longline gear. However limited landings by longline vessels are allowed, incidental to other target fisheries and subject to target catch requirements. An owner or operator of a vessel that has a Longline category Atlantic Tunas Permit may retain, possess, land, or sell large medium and giant bluefin tuna taken incidentally in fishing for other species. Limits on such retention/possession/landing/sale are as follows:

1. For landings south of 34 00' N, one large medium or giant bluefin tuna per vessel per trip may be landed, provided that for the months of January through April at

least 1,500 pounds (680 kg), and for the months of May through December at least 3,500 pounds (1,588 kg), either dressed weight or whole weight, of species other than bluefin tuna are legally caught, retained, and offloaded from the same trip and are recorded on the dealer weighout slip as sold.

2. For landings north of 34 00' N, landings per vessel per trip of large medium and giant bluefin tuna may not exceed two percent by weight, either dressed weight or whole weight, of all other fish legally caught, retained, and offloaded from the same trip and which are recorded on the dealer weighout slip as sold.

Bycatch of BAYS

There are few data regarding bycatch of Atlantic tunas other than bluefin. BAYS tunas are caught incidentally in HMS fisheries, as well as in fishing operations for other fisheries (e.g., coastal driftnet and sink gillnet fisheries for bluefish), and the tunas are sold along with the targeted species. The pelagic longline fishery discards relatively few yellowfin tuna throughout its range (Table 3.33.). There are some data available on rod and reel bycatch of Atlantic tunas, other than bluefin, collected through the Large Pelagic Survey and the Marine Recreational Fisheries Statistics Survey, but magnitude of these figures is extremely low when compared to actual landings figures. This could indicate that few undersized fish were discarded, or that the survey does not effectively collect discard information. Tournament reporting requirements will facilitate analysis of dead discards of BAYS tunas as these species are sometimes targeted during tournament fishing.

Bycatch of Swordfish

North Atlantic swordfish are overfished and therefore NMFS seeks to limit bycatch mortality on this stock by the directed swordfish fishery and incidental fisheries (e.g., squid trawl). The majority of discards, however, are small swordfish in the pelagic longline fishery. ICCAT scientists concluded that if catches of undersized swordfish are reduced stock-wide, substantial gains in yield could accrue. To support rebuilding of North Atlantic swordfish, NMFS seeks to reduce bycatch of undersized swordfish. Incidental catch of undersized swordfish by U.S. pelagic longline fishermen is concentrated in a few areas, considered "nursery" areas.

Essential fish habitat for juvenile and sub-adult swordfish is identified as a much larger area for the purposes of consistency with the Magnuson-Stevens Act requirements. These areas include, but are probably not limited to, the Venezuelan Basin, areas in the Gulf of Mexico, and areas off the east coast of Florida and South Carolina. Vessels from Spain, Portugal, and other nations reported significant catches of undersized swordfish in 1997 (less than 30 percent of total swordfish catch). NMFS is completing analyses to identify an effective time/area closure in order to reduce bycatch of small swordfish by pelagic longline fishermen and will present these alternatives to the HMS Advisory Panel in June 1999.

Under the Magnuson-Stevens Act definition, swordfish kept and sold in the squid trawl fishery are not bycatch. However, they are incidental catch and NMFS seeks to minimize swordfish interactions with squid trawl gear. Swordfish discarded in the squid fishery, for whatever reason, are considered bycatch. Once the retention limits are met, all swordfish are discarded. Swordfish incidental catch data are submitted by trawl vessel operators in pelagic logbooks (landings and discards, Table 3.29), by swordfish dealers (landings only, Table 3.30, Figure 3.6), and by observers (landings and discards and size distribution of catch). Based on a preliminary analysis of the NMFS swordfish quota monitoring database (dealer reports and logbooks) and pelagic logbook database for 1997 catches of swordfish, squid trawl fishermen reported landing six mt dw (eight mt ww). All swordfish were landed in the mid-Atlantic area. The following table indicates monthly trends in pounds of dressed swordfish.

Table 3.29 Number of Swordfish Caught by Squid Trawl Vessels Reported in the Pelagic Logbook, 1996 and 1997.

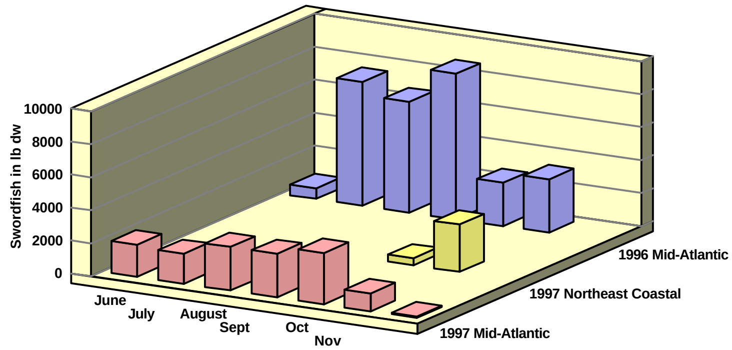
Year	Number of Trips Reported	Number of Swordfish Kept	Number of Swordfish Released Dead	Number of Swordfish Released Alive
1996	17	39	2	5
1997	17	33	22	4
Total	34	72	24	11

Table 3.30 Landings of Swordfish in Squid Trawl Fishery in 1997 in pounds dressed weight (based on dealer reports).

	June	July	August	September	October	November	December
Landings	1955	1824	2639	2638	3105	1071	70

Squid fishermen frequently do not submit catch and effort data through the Pelagic Logbook system (except when swordfish are landed) and NMFS continues to assemble swordfish bycatch data from the multispecies logbook database. Also, the Pelagic Logbook provides very limited data for swordfish interactions with the trawl fishery (catch and discards) because the report form is not designed for collecting effort information for this gear. In 1997, 34 trips, taking place in June to December, were identified as squid trawl trips on pelagic logbook forms. During those trips, a reported 104 swordfish were caught, 23 percent of those fish (24 swordfish) were discarded dead, another nine percent (nine swordfish) were discarded alive. The remainder of the swordfish were kept. Thirty percent of the discarded swordfish were caught on trips in which five swordfish were landed. It is possible these fish were discarded because the swordfish bycatch limit for the squid trawl fishery had been reached, or because they were undersized, or for discretionary, economic, or personal reasons. The squid fishery is subject to limited observer coverage. NMFS will continue to assemble data and monitor bycatch of swordfish in this fishery to account for all sources of mortality.

Figure 3.6 Landings of Swordfish by Month in Trawl Fishery (1996 to 1997) based on dealer reports.



Bycatch of Sharks

Because large coastal sharks are overfished and small coastal and pelagic sharks are fully fished, the bycatch of sharks by HMS fishermen and fishermen participating in other fisheries is a concern. Due to the seriously depleted status of some species of Atlantic sharks, particularly the dusky, night, and sand tiger sharks, these incidental catches and associated mortality may slow or prevent rebuilding of individual species or entire complexes of species to maximum sustainable yield levels. The implementation of a minimum size for ridgeback large coastal sharks in commercial fisheries and for all sharks in recreational fisheries will result in regulatory discards of undersized sharks being considered bycatch. NMFS identifies the bycatch of sharks in non-HMS fisheries and bycatch of undersized sharks in all fisheries as a priority and intends to assemble data from state and federal databases to address this issue. Gears of concern to declining shark populations include trawl, pelagic longline, drift gillnet, and purse seine. Bottom longline gear is not currently a concern because most sharks caught in directed bottom longline fisheries are retained; however, the addition of several species to the prohibited species management unit as well as the ridgeback large coastal sharks minimum size may result in increased bycatch in these fisheries. Increased observer coverage in directed shark bottom longline fisheries and the activities of the Atlantic Coastal Cooperative Statistics Program will be instrumental in identifying and quantifying the bycatch concern for Atlantic sharks.

3.5.2.2 Finfish Bycatch in HMS Fisheries

Addressing Bycatch

This section outlines finfish bycatch in HMS fisheries; followed by management measures to minimize this bycatch.

Pelagic Driftnet Fishery

The pelagic driftnet fishery encountered many types of pelagic finfish. Most fish were retrieved dead from the net. Non-target finfish caught in this fishery in 1987 to

1995 included the following species: bluefin tuna, BAYS tunas, billfish, large coastal sharks, and pelagic sharks. Tables 3.31 and 3.32 show discarded finfish in the August 1998 pelagic driftnet fishery. Bycatch of these species pose a concern due to the overfished status of the large coastal sharks, bluefin tuna, and marlin. This gear is now prohibited.

Table 3.31 Discarded Highly Migratory Species Caught in the Pelagic Driftnet Fishery for Swordfish in August 1998.

Species	Weight of Discarded Fish (pounds ww)
Skipjack Tuna	42,942
False Albacore	257
Bluefin Tuna	4,805
Bigeye Tuna	289
Yellowfin Tuna	256
Unclassified tuna	45
Albacore	89
Unclassified Shark	66,325
Blue shark	32,961 +2575 fins
Scalloped hammerhead	26,850
Dusky shark	6,730
Basking shark	4,760
Unclassified hammerhead	2,245
Bigeye thresher	935
Bull shark	800
Smooth hammerhead	640
Tiger shark	600
Great hammerhead	300
Shortfin mako	390
Longfin mako	250
Sandbar shark	725
Blacktip shark	60
Unclassified mako	25
White marlin	490
Blue marlin	3,390
Swordfish	1,723
Unclassified marlin	950

Table 3.32 Discards of Non-HMS in the Pelagic Driftnet Fishery in August 1998 (based on 100 percent observer coverage)

Species	Weight (pounds ww)
Manta Ray	45018 +1210
Jellyfish	220
Frigate mackerel	123
Unclassified mackerel	54
Stingray	16
Devil ray	1875
Cownose ray	200
Ribbonfish	3
Ocean sunfish (mola mola)	4,940
Slender ocean sunfish	350
Sharptail mola	200
Unclassified mola	100
Bluefish	46

Pelagic Longline Fishery

Although the NMFS Bycatch Plan (NMFS, 1998c) considers all non-target species as bycatch, regardless of whether they are kept and sold or discarded, this section will address the bycatch (using Magnuson-Stevens Act) of discarded non-HMS species and discarded HMS. NMFS views the pelagic longline fishery as a truly multi-species fishery and the composition of the catch depends on the fishing area and the season. Although some species are marketable, they may be discarded for discretionary, economic, or personal reasons. Therefore, commonly caught species such as dolphinfish and wahoo are considered as bycatch when they are discarded. The pelagic longline fishery has expanded in many areas to include dolphin and wahoo as "target" species possibly as a result of decreasing swordfish quotas. The following information (Tables 3.33, 3.34) is based on pelagic logbook data that fishermen report. NMFS reports dead discards only to ICCAT (e.g., U.S. National Report) therefore, NMFS has developed methods for accurately estimating dead discards based on observer and logbook data (e.g., Cramer and Adams, 1998a, Table 3.35). NMFS also examines the disposition of all released fish, the total bycatch (dead plus alive), in references such as the Large Pelagic Logbook Newsletter (Cramer and Adams, 1998b).

Table 3.33 Catch of Yellowfin Tuna in the 1996 pelagic longline fishery reported in pelagic logbooks.

Area	Number Caught (Kept and Discarded)	Percent Kept	Percent Discarded Dead	Percent Discarded Alive
CAR	780	85	0	13
GOM	31,568	97	0	1
FEC	762	96	1	1
SAB	6,102	95	1	3
MAB	10,199	96	1	2
NEC	5,860	97	0	1
NED	363	96	0	2
SAR	79	97	0	2
NCA	888	98	0	0
TUN	4,558	96	0	2
TUS	742	90	0	8
TOTAL	**61,901**	**96**	**1**	**2**

Table 3.34 Catch of Swordfish in the 1996 pelagic longline fishery reported in pelagic logbooks.

Area	Number Caught (Kept and Discarded)	Percent Kept	Percent Discarded Dead	Percent Discarded Alive
CAR	12,696	79	10	9
GOM	18,710	68	18	13
FEC	13,394	55	31	12
SAB	15,887	68	18	12
MAB	1,924	78	9	11
NEC	1,661	81	8	10
NED	14,494	87	7	5
SAR	722	90	4	5
NCA	6,552	93	2	3
TUN	4,508	87	5	6
TUS	4,088	95	2	2
TOTAL	**94,636**	**75**	**14**	**9**

Table 3.35 Estimated Swordfish discarded dead by number of fish and weight in 1997 by pelagic longline gear. (Cramer and Adams, 1998a)[1]

Area	Number	Metric Tons
Gulf of Mexico	8,642	100.39
Northwest Atlantic	15,450	249.89
Caribbean	957	15.97
Grand Banks	3,689	49.33
South Atlantic	1,359	21.09
Unknown	437	6.78

[1]Estimates based on pelagic logbook and observer data.

Billfish: NMFS is concerned about the number of billfish caught in the pelagic longline fishery. Because these species are not permitted to be landed, all marlin, sailfish, and spearfish must be discarded. However, the relative magnitude and frequency of encounters of billfish with pelagic longline gear (responsible for most of the commercial bycatch of billfish) affect the approach necessary to reduce this bycatch. In 1995 (based on observer data), billfish represented a total of 1.26 percent (by number) of the pelagic longline catch (blue marlin - 0.49 percent; white marlin - 0.49 percent; sailfish - 0.2 percent; and spearfish - 0.07 percent). A total of 69.2 percent of these billfish were released alive (blue marlin - 74.4 percent; white marlin - 68.8 percent; sailfish - 58 percent; and spearfish - 64.7 percent).

Table 3.36 Estimated Billfish Discarded Dead by Number of Fish and Weight in 1997 by Pelagic Longline Gear (Cramer and Adams, 1998a).[1]

Area	Blue Marlin		White Marlin		Sailfish	
	Number	**mt ww**	**Number**	**MT**	**Number**	**mt ww**
Gulf of Mexico	693	42.39	638	12.62	586	12.56
Northwest Atlantic	289	18.23	561	11.10	426	9.13
Caribbean	335	23.96	341	6.5	145	3.12
Grand Banks	37	2.26	23	0.46	0	0
South Atlantic	668	40.86	1877	37.14	1488	31.89
Unknown	36	2.2	69	1.37	49	1.05

[1]Estimates based on pelagic logbook and observer data.

NMFS examined data to identify areas where billfish bycatch may have been concentrated ("hot spots") but because billfish are so widely distributed, these analyses do not produce any "hot spots." Closing certain areas would be relatively ineffective if fishermen fish on the "fringes" of the closed area. Displaced effort would likely harvest as much billfish and target catch would be likely unaffected. Additional investigation and discussions are needed to pursue the development of time/area closures that will reduce billfish bycatch consistent with all the National Standards. NMFS, aided by the HMS and Billfish Advisory Panels, is developing alternatives for a more effective time/area closure to protect small swordfish that may significantly reduce fishing effort during certain times of the year. This closure may benefit billfish by reducing bycatch mortality.

<u>King mackerel (*Scomboromorus cavalla*)</u>: King mackerel are caught in low numbers by pelagic longline fishermen and are typically sold, although they are sometimes discarded. The impact of this bycatch on king mackerel stocks is sufficiently minimal to be acceptable at this time. It is included in mackerel stock assessments conducted pursuant to the Gulf and south Atlantic mackerel FMP.

<u>Oilfish (*Ruvettus pretiosus*)</u>: Large numbers of oilfish, or escolar, are caught in the Southeast Coastal area, the Caribbean, and the Gulf of Mexico; some are retained, others have been reported as discarded (dead or alive). Based on 1997 pelagic logbook data, 7,192 oilfish were reported caught in the pelagic longline fishery. Of these, 77 percent were kept. Of the oilfish that were discarded, 56 percent were reported discarded alive. Bycatch of oilfish may need to be addressed if the mortality increases. This species has been receiving negative attention in the press due to its purgative effects, which may prompt fishermen to discard more oilfish than they had previously.

<u>Large coastal and pelagic sharks</u>: Several species of large coastal (dusky, silky, hammerhead, and night) and pelagic sharks (mako, thresher, porbeagle and blue) are

frequently caught in pelagic longline fisheries; some are retained due to high fin and meat market value, others are reported as discarded (dead or alive). Based on pelagic logbook data, in 1996, approximately 360 mt dw of large coastal sharks (primarily sandbar and blacktip sharks) and 200 mt dw of pelagic sharks (primarily mako) were landed, whereas approximately 64 mt ww of large coastal sharks (primarily dusky, silky, and unidentified sharks) and 840 mt ww of pelagic sharks (primarily blue sharks) were discarded dead in pelagic longline fisheries (Cramer *et al*., 1997). Because large coastal sharks are overfished and pelagic sharks are fully fished, NMFS seeks to minimize interactions between these species and pelagic longline gear.

Table 3.37 Estimated Sharks Discarded Dead by Number of Fish and Weight in 1997 by Pelagic Longline Gear (Cramer and Adams, 1998a).[1]

Area	Number	Metric Tons
Gulf of Mexico	1,578	44.75
Northwest Atlantic	7,121	257.22
Caribbean	738	24.35
Grand Banks	3,459	86.73
South Atlantic	453	15.67
Unknown Area	166	5.58

[1]Estimates based on pelagic logbook and observer data.

Bottom Longline Fishery

From 1994 through 1996, observer data indicate that approximately 3.2 percent of the catch (546 fish) in directed bottom longline sets targeting sharks consisted of finfish. Eight species comprised 90 percent of finfish species bycatch including, in order of occurrence, snappers/groupers, red drum, cobia/dolphin, catfish, eel, barracuda, tuna/swordfish, and jacks (Branstetter and Burgess, 1998a.). Marketable species such as snapper/ grouper and dolphin are usually retained. Bycatch in this fishery does not currently have a significant impact on any of the bycatch species, however, it may need to be addressed if bycatch mortality increases.

Rod and Reel Fishery

Bycatch in the rod and reel fisheries (commercial and recreational) is varied. Information is collected by the Large Pelagic Survey (dockside and telephone surveys) and by the Marine Recreational Fisheries Statistical Survey. These "raw" data can be summarized by area, however, actual number of fish discarded for many species, is so low, that presenting these data by area may be misleading, particularly if expansion estimates are made in the future. Therefore, NMFS presents the "raw" data for bycatch species in the rod and reel fishery in summary format (for all areas) in Table 3.38. In the commercial bluefin rod and reel fishery, other tunas species or undersized bluefin tuna may be caught as bycatch, however these vessels have not been selected in the recent past for observer coverage. In the recreational rod and reel fishery, it is difficult to discuss "bycatch" because many fishermen value the experience of fishing and may not be targeting a particular pelagic species. Recreational "marlin" or "tuna" trips may yield dolphin, tunas, wahoo, and other species, both undersized and legally sized individuals. Bluefin trips may yield undersized bluefin or a seasonal closure may prevent landing of bluefin tuna above the minimum size.

Table 3.38 Reported Discards[1] of HMS in the Rod and Reel Fishery. (Based on 1997 Large Pelagic Survey, from 3538 total dockside intercepts)

Species	Number of Fish Kept	Number of Fish Discarded Alive	Number of Fish Discarded Dead
White Marlin[2]	7	203	0
Blue Marlin[2]	2	30	0
Sailfish[2]	0	2	0
Swordfish	5	6	0
Bluefin tuna	749	1,181	123
Bigeye tuna	17	6	6
Yellowfin tuna	1,632	224	8
Skipjack tuna	285	468	60
Albacore tuna	189	43	2
Thresher shark	3	2	0
Mako shark	51	86	3
Sandbar shark	5	30	1
Dusky shark	16	50	0
Tiger shark	0	5	0
Blue shark	68	1,897	5
Hammerhead shark	1	4	0
Wahoo	6	1	0
Dolphinfish	920	61	0
King mackerel	174	1	6
Atlantic bonito	336	203	1
Little tunny	587	1,015	17
Amberjack	3	18	0

[1] NMFS typically expands these "raw" data to report discards of bluefin tuna by the rod and reel fishery to ICCAT. If sample sizes are large enough to make reasonable discard estimates for other species, NMFS may estimate discard estimates of other bycatch species in future SAFE reports.

[2] Amendment One to the Atlantic Billfish FMP established billfish released in the recreational fishery and a "catch and release" program, thereby exempting these fish from bycatch considerations.

[3]NMFS reported 14.6 mt of dead discards of bluefin tuna in the rod and reel fisher to ICCAT for 1997 (NMFS, 1998b).

Shark Drift Gillnet Fishery

From 1993 to 1995, 48 trips and 52 net sets were observed in the shark drift gillnet fishery. Eight shark species made up over 99 percent of sharks caught including, in order of abundance by weight, blacknose, Atlantic sharpnose, blacktip, finetooth, scalloped hammerhead, bonnethead, spinner, and great hammerhead. Ten bycatch species of finfish and rays made up over 97 percent of the non-shark catch including, in order of abundance, king mackerel, little tunny, cownose ray, crevalle jack, cobia, spotted eagle ray, great barracuda, tarpon, Atlantic stingray, and Spanish mackerel (Trent *et al*., 1997). Although most of the catch is landed, the shark drift gillnet fishery may discard the following species: king mackerel, little tunny, crevalle jack, cobia, great barracuda. Some species are always discarded for regulatory or personal reasons (e.g., cownose ray, spotted eagle ray, tarpon, and Atlantic stingray).

Purse Seine Fishery

There are no recorded instances of non-tuna finfish, other than minimal numbers of blue sharks, caught in tuna purse seines. Anecdotal evidence indicates that if fish are discarded, they are easily released out of the net with minimal bycatch mortality.

Table 3.39 1996 Purse Seine Atlantic Tunas Discards (based on NMFS observer data - 95.6% coverage for a total of 44 hauls observed).

Reason	Pounds of Discarded Tunas (mt ww)
Fell out/off of gear	2,310 (1.1)
No market, too small	59,100 (26.8)
Undersized	34,745 (15.8)
Regulations prohibit retention, quota filled	5,500 (2.5)
Other	18,179[1] (8.2) 900[2] (0.4)

[1]escaped alive as net opened

[2]too few fish to "bother" with, released alive

Harpoon Fishery

The deliberate fishing nature of harpoon gear is such that bycatch is expected to be low. Harpoon vessels targeting bluefin tuna have not been selected for observer coverage in the recent past. Therefore, there are no recorded instances of non-target finfish caught with harpoons and NMFS cannot quantify the bycatch of undersized bluefin tuna in this fishery. Bycatch in the swordfish harpoon fishery is expected to be zero given the small minimum size for that species relative to the size of the fish that are potentially harpooned.

Conclusion

NMFS will continue to work with the Advisory Panels, Fishery Management Councils, and constituents to evaluate the need for reducing the bycatch of non-HMS species in HMS fisheries. Note that due to the historical monitoring programs focusing on certain fisheries, NMFS has the most bycatch data for the pelagic longlines and now prohibited pelagic driftnets. NMFS also collects bycatch data in the Large Pelagic

Survey but due to the low number of intercepts in which fish are released dead, the dead discard estimates have not yet been calculated for all species. In this FMP, NMFS implements other measures that will increase reporting in other fisheries and can therefore, more accurately quantify bycatch in other fisheries.

Addressing Bycatch Mortality

The reduction of bycatch mortality is an important component of NS 9. Physical injuries may not be apparent to the fisherman who is quickly releasing a fish, turtle, or mammal, and there are inherent injuries associated with the stress of being hooked or caught in a net. NMFS will continue to collect information on bycatch mortality of these animals and will, in the future, account for bycatch mortality in stock assessments.

Pelagic Driftnet Fishery

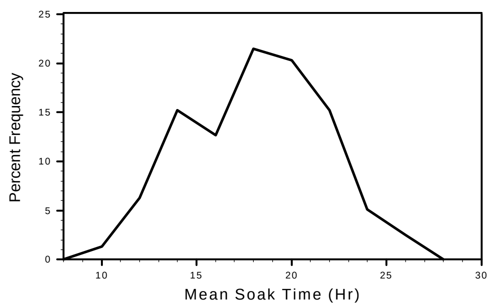
It is difficult to consider reducing bycatch mortality in the pelagic driftnet fishery due to the nature of the gear. Most finfish are dead when the net is hauled. For this reason and the non-selectivity of the driftnet gear, this gear is prohibited for taking all HMS, except sharks.

Pelagic Longline Fishery

NMFS collects information regarding the bycatch mortality of dead finfish in the pelagic longline fishery. Also, Berkeley and Edwards (1997) indicate that many billfish remained alive in their study for long periods on the longline, with 60 percent alive after 6 hours and some billfish living for 12 hours or more before being released alive. Preliminary data from this study suggest that hook damage and entanglement with the gangion may be important factors causing mortality in longline caught bycatch. That study indicated that it may be possible to modify hook type and gangion material to reduce billfish mortality in longline fisheries. To follow up on this study, NMFS is supporting a study to consider the use of circle hooks in the pelagic longline fishery and NMFS has considered reducing the soak time in this fishery. Very often, gear modifications are not easily enforced and therefore, NMFS encourages pelagic longline fishermen to take voluntary steps to increase survival of released finfish.

The survival rate of billfish on pelagic longline gear is validated by results from a study by Berkeley and Edwards (1997), stating that 20 to 75 percent of billfish were alive 12 hours after being hooked (Figure 3.7). After accounting for live releases, the effective billfish fishing mortality (i.e., discarded dead) was 0.4 percent of the total pelagic longline catch (blue marlin - 0.12 percent; white marlin - 0.15 percent; sailfish - 0.08 percent; and spearfish - 0.03 percent). A total bycatch mortality impact of pelagic longline gear can not be determined since the release mortality is unknown for the hooked billfish fish that are released alive. Billfish, however, tend to have higher survival rates on a pelagic longline (Berkeley and Edwards, 1997) compared to other HMS species such as swordfish and tunas.

Figure 3.7 Proportion of HMS Alive After Hook-up on a Pelagic Longline. (Berkeley and Edwards, unpublished data)



Rod and Reel

The Large Pelagic Survey has collected data on live and dead discards from the rod and reel fishery for several years. In 1997, an estimated 15 mt of bluefin were discarded dead by rod and reel fishermen. Quantitative estimates of post-release mortality rates of sharks in rod and reel fisheries are not currently available, although this mortality is generally believed to be low. There are some data available on rod and reel bycatch mortality of Atlantic tunas, other than bluefin, collected through the Large Pelagic Survey and the Marine Recreational Fisheries Statistics Survey, but magnitude of these figures is extremely low when compared to actual landings figures. NMFS has not estimated bycatch mortality of swordfish in the recreational fishery because the recreational fishery encounters swordfish infrequently.

Results from a recent study indicate that immediate fishing mortalities in recreational hook and line-caught juvenile bluefin tuna can be substantial (29.2 percent) due to injuries or predation (Belle, 1997). This is likely to be a conservative estimate because scientific personnel in the study were professionally trained and had extensive experience in fish handling techniques designed to reduce mortality. Mortality often occurs ten minutes or longer after the fish is released under normal circumstances. Injuries may not be readily apparent to the angler and seemingly minor capture injuries may be related to substantial internal injuries. Forty percent of sampled tuna that died during that study did not have injuries that would be apparent to the angler in the boat. Skomal and Chase (1996) provide evidence that the extreme stress of rod and reel angling did not cause immediate post-release mortality in larger bluefin tuna (50 to 150 kg). However, they do document metabolic and pH disturbances in bluefin tuna sampled off of Hatteras, NC. The physiological consequences of angling stress are poorly understood for several species of large pelagic fishes (Skomal and Chase, 1996). NMFS continues to support studies on recreational post-release mortality and intends to account for this source of mortality when additional information becomes available.

Table 3.40 Existing information on HMS bycatch mortality.

Study	Methods	Conclusions
Belle, 1997	Catch of juvenile BFT and release into net pen	29% immediate post-release mortality
Skomal and Chase, 1996	Catch of large BFT (50-150 kg) and sonic tracking in the wild	0% immediate post-release mortality
Berkeley and Edwards, 1997	GOM Longline catch, hook timers	Survival depends on species and length of time fish is hooked before being released
Skomal and Chase, in progress	Catch of juvenile BFT and sharks and sonic tracking in the wild	

NMFS' code of angling ethics is a code of conduct for recreational fishing which was developed as part of implementing Executive Order 12962 - Recreational Fisheries. NMFS implements a national plan to support, develop, and implement programs that are designed to enhance public awareness and understanding of marine conservation issues relevant to the well-being of marine recreational fishing. This code is consistent with National Standard 9, minimize bycatch and bycatch mortality, and is therefore reproduced below. These guidelines are discretionary, not mandatory, and are intended to inform the angling public of NMFS's views regarding what constitutes ethical angling behavior.

Code of Angling Ethics

- Promotes, through education and practice, ethical behavior in the use of aquatic resources.
- Values and respects the aquatic environment and all living things in it.
- Avoids spilling, and never dumps any pollutants, such as gasoline and oil, into the aquatic environment.
- Disposes of all trash, including worn-out lines, leaders, and hooks, in appropriate containers, and helps to keep fishing sites litter-free.
- Takes all precautionary measures necessary to prevent the spread of exotic plants and animals, including live baitfish, into non-native habitats.
- Learns and obeys angling and boating regulations, and treats other anglers, boaters, and property owners with courtesy and respect.
- Respects property rights, and never trespasses on private lands or waters.
- Keeps no more fish than needed for consumption, and never wastefully discards fish that are retained.

- Practices conservation by carefully handling and releasing alive all fish that are unwanted or prohibited by regulation, as well as other animals that may become hooked or entangled accidentally.
- Uses tackle and techniques which minimize harm to fish when engaging in "catch and release" angling.

3.5.2.3 Marine Mammal Bycatch in HMS Fisheries

Marine mammal bycatch is identified and quantified in HMS fisheries through a process that culminates in the publication of an annual "List of Fisheries" for commercial fisheries only. The most recent List of Fisheries is for 1999 and the analysis utilizes data collected from the 1992 to 1995 pelagic longline fishery, the 1992 to 1996 coastal gillnet fishery, 1992 to 1996 shark drift gillnet fishery, and the 1996 tuna purse seine fishery (NMFS, 1999b). Commercial rod and reel, harpoon, purse seine, charterboat HMS, and shark bottom longline fisheries have been designated Category III with respect to marine mammal takes. Therefore, discussions of marine mammal takes in the past in this fishery are no longer relevant to HMS fishery management. Recreational fisheries are not considered under the MMPA.

The Atlantic Offshore Cetacean Take Reduction Team was formed in 1996 under a requirement of the MMPA to address protected species bycatch by vessels using pelagic longline, pair trawl, and pelagic driftnet gear to catch Atlantic tunas and swordfish. That team produced a draft plan to reduce marine mammal takes with those gears which was submitted to NMFS in November 1996 (AOCTRT, 1996). In the time since the plan was submitted, fishermen have not been authorized to use pair trawls to fish for HMS and driftnets have been prohibited in the Atlantic swordfish fishery (except August 1998). The draft plan, however, also recommended a suite of gear modification and educational measures to reduce bycatch of marine mammals in the pelagic longline fishery. The inability to enforce many of these measures, due to the nature of the measures, is seen by NMFS management and enforcement staff, HMS and Billfish AP members, and USCG personnel as an obstacle to reducing bycatch in HMS fisheries. The plan recommended non-regulatory measures which included increased research on acoustic deterrents, more comprehensive educational programs for fishery participants, and research on cetacean behavior.

NMFS convened this take reduction team in 1996, and the team initially considered data on marine mammal takes from 1992 to 1995. In some cases, the team considered anecdotal data only. Additional logbook and observer data have since been collected, and 1996 and 1997 data have been analyzed with respect to some of the recommended measures on that AOCTRP. In fact, several notable changes have occurred since the team last met in 1996. NMFS prohibited the use of pair trawls and driftnets in the Atlantic pelagic fishery. Pelagic longline takes of marine mammals were reduced in 1998. NMFS reviewed the 1999 draft Stock Assessment Report for pilot whales and other marine mammal species caught by pelagic longlines and has reviewed total take rates for these animals. NMFS concluded that all the measures recommended by the team for pelagic longlines may not be necessary to achieve the goals of the MMPA.

NMFS is concerned, however, about serious injuries of marine mammals caught in the pelagic longline fishery. NMFS will release serious injury guidelines, re-evaluate interactions in the pelagic longline fishery, and may reconvene a take reduction team to address pilot whale takes in this fishery. The following analyses of alternatives will not consider recent data in an effort to present the recommendations of the Team's consensus.

Pelagic Driftnet Fishery

The Atlantic pelagic driftnet fishery has been listed under the MMPA List of Fisheries as a Category I fishery since 1991 due to takes of marine mammals which exceed 50 percent of the potential biological removal (PBR) level.

The AOCTRP was submitted to NMFS in 1996 with recommended measures to reduce interactions of marine mammals with driftnet gear. In 1998, the swordfish driftnet fishery opened with no take reduction measures in place. NMFS placed observers aboard ten different domestic swordfish driftnet vessels targeting swordfish in 1998; fully 100 percent of the sets were observed. Typically, animals (finfish and protected species) entangled in a pelagic driftnet are retrieved dead. In August 1998 during a two-week season in which 106 driftnet sets were made, 295 marine mammals and 34 sea turtles were entangled in driftnet gear. All of the marine mammals were killed. Marine mammals included common dolphins, striped dolphins, Risso's dolphins, pilot whales, beaked whales, bottlenose dolphins, and white sided dolphins. No threatened or endangered marine mammals were taken. A right whale was entangled by a driftnet although the right whale was already entangled in pot gear. The take was subsequently attributed to the lobster fishery.

Table 3.41. Takes of marine mammals in the 1998 pelagic driftnet fishery for swordfish. (Based on NMFS observer data: 100 percent coverage).

Species	Number Entangled
NK Beaked Whale	8
Sowerby's beaked whale	2
True's beaked whale	1
Bottlenose dolphin	3
NK dolphin	1
Saddleback dolphin	253
Striped dolphin	4
Grampus	9
Pilot whale	6
Long-finned pilot whale	6
Total marine mammals	**293**

NMFS does not anticipate that fishermen will take driftnet trips to pursue large coastal sharks given the limited quota for large coastal sharks and the requirement to discard all tunas and swordfish. If the bycatch of pelagic driftnets needs further reduction, appropriate action will be taken at that time.

Pelagic Longline Fishery

The pelagic longline fishery is listed as a Category I fishery, which results in increased bycatch data collection, including observer and logbook data. The most recent annual estimate indicates that the U.S. Atlantic pelagic longline fleet caught 39 marine mammals in 1997; all were released alive. Most of the marine mammals were encountered in the U.S. EEZ between South Carolina and Cape Cod. NMFS continues to be concerned, however, about post-release mortality of injured short-finned pilot whales in the pelagic longline fishery. NMFS will continue to evaluate observer data regarding the extent of injuries to marine mammals that interact with pelagic longline fishing gear and will work towards minimizing bycatch mortality through educational workshops with fishermen.

Table 3.42. Summary of marine mammal species incidentally injured or killed in the pelagic longline fishery. (Taken from NMFS, 1999b).

Species	Stock
Humpback whale	West North Atlantic
Minke Whale	Canadian East Coast
Risso's Dolphin	West North Atlantic, North Gulf of Mexico
Long-finned pilot whale	West North Atlantic
Short-finned pilot whale	West North Atlantic
Common dolphin	West North Atlantic
Atlantic spotted dolphin	West North Atlantic, North Gulf of Mexico
Pantropical spotted dolphin	West North Atlantic, North Gulf of Mexico
Striped dolphin	West North Atlantic
Bottlenose dolphin	West North Atlantic offshore, Gulf of Mexico outer Continental Shelf, Gulf of Mexico Continental Shelf Edge and Slope
Harbor porpoise	Gulf of Maine/Bay of Fundy

Shark Drift Gillnet Fishery

The southeast shark drift gillnet fishery is classified as a Category II fishery that is believed to be responsible for bycatch of at least one right whale. This fishery is subject to the regulations implementing the Atlantic Large Whale Take Reduction Plan, which requires that shark drift gillnet gear be marked; establishes a closed period and restricted area from November 1 through March 31 each year, for the area near Savannah, GA, south to near Sebastian Inlet, FL; requires 100 percent observer coverage outside the closed area; establishes special provisions for strikenets; and establishes a provision to close the restricted area to this gear type if an entanglement with this gear occurs (February 16, 1999, 64 FR 7529). From 1996 through the first fishing period of 1998, no shark drift gillnet vessels were observed due to administrative problems with observer placement. However, beginning in the second fishing period of 1998, shark drift gillnet fishermen were informed of the requirement to notify NMFS of trips and to carry observers. In 1998, nine sets were observed outside the right whale season, and four fishermen have been taking observers since January 1999. This FMP establishes 100 percent observer coverage in this fishery at all times and thus prohibits the use of shark drift gillnet gear if a NMFS-approved observer is not on board the vessel. These measures are intended to obtain better information for addressing protected species bycatch and bycatch mortality in this fishery.

Table 3.43 Summary of marine mammal species incidentally injured or killed in the shark drift gillnet fishery (Taken from NMFS, 1999b).

Species	Stock
Bottlenose dolphin	West North Atlantic coastal
North Atlantic right whale	West North Atlantic

Current takes of marine mammals in the harpoon and rod and reel HMS fisheries appear to be virtually non-existent.

Table 3.44 1996 purse seine marine mammal discards. (Based on NMFS observer data - 95.6% coverage for a total of 44 hauls observed)

Species Captured	Number and Status of Released Animal
Humpback Whale	1 released alive
Minke Whale	1 released alive
Pilot Whales	6 released alive

3.5.2.4 Sea Turtle Bycatch in HMS Fisheries

Retention of endangered (Kemp's Ridley, Green, Leatherback, and Hawksbill turtles) and threatened (loggerhead turtles) sea turtles is prohibited under the authority of the Endangered Species Act. Bycatch is minimized through regulatory and non-regulatory implementation of the terms and conditions of the Incidental Take Statement.

Pelagic Driftnet Fishery

Sea turtles have been encountered in the pelagic driftnet fishery for swordfish and tunas in the past. The majority were released dead. The following table is a one-year snapshot of the turtle takes in this fishery. NMFS prohibited this fishing gear to reduce bycatch in the swordfish and tunas fisheries.

Table 3.45 Takes of sea turtles in the 1998 pelagic driftnet fishery for swordfish. (Based on NMFS observer data: 100% coverage)

Species	Number Entangled
Green turtle	2
Leatherback turtle	5
Loggerhead turtle	27
Total sea turtles	**34**

Pelagic Longline Fishery

The pelagic longline fleet caught an estimated 544 turtles in 1997; all were released alive. Most turtles (57 percent) were caught outside the U.S. Atlantic EEZ, predominantly the Northeast Distant area. For 1992 through 1997, the estimated catch for turtles ranged from a low of 544 (95 percent CI 265 to 1205) in 1997 to a high of 3,716 (95 percent CI 2,797 to 4,933) in 1995. The number of dead turtles ranged from zero to 63 (95 percent CI 13 to 322). These are preliminary estimates based on observer data and fishing effort reported by the fleet. The number of turtles caught per longline set ranged from one to nine with 77 percent of the sets catching only one turtle. The most common species were loggerhead turtles (53 percent of observed turtles), followed by leatherback turtles (42 percent of observed turtles). Green, Hawksbill, and Kemp's Ridley turtles were also observed in this fishery. The relative frequency of observed bycatch of turtles was lower in 1996 to 1997 than 1992 to 1995.

Shark Drift Gillnet Fishery

During the period 1993 to 1995, 48 trips and 52 net sets were observed in which two loggerhead turtles were captured and released alive (Trent *et al*., 1997). Subsequent observers have documented no sea turtle takes in nine drift gillnet sets. This FMP establishes 100 percent observer coverage in this fishery at all times and prohibits use of shark drift gillnet gear if a NMFS-approved observer is not on board the vessel. These measures are intended to obtain better information for addressing protected species bycatch and bycatch mortality in this fishery. Although observed takes of turtles in the shark drift gillnet fishery are low, turtle distribution overlaps with fishery operation and turtles are very susceptible to this type of fishing gear.

Other HMS Fisheries

Sea turtles have been reported as caught in rod and reel fishing gear, although few incidents have been reported. No sea turtles have been reported caught in the purse seine or harpoon HMS fisheries.

3.5.2.5 Sea Bird Bycatch in HMS Fisheries

NMFS analyzes observer data to collect sea bird bycatch information. In 1996, no sea birds were reported in Atlantic pelagic longline or purse seine observer data. In 1997, 18 were recorded as dead (11 in South Atlantic Bight, six in Northeast Coastal, and one in Mid-Atlantic Bight) and 15 were recorded as released alive (Northeast Coastal) in the pelagic longline database. Sea birds have not been recorded interacting with other Atlantic HMS fishing gears.

3.5.2.6 Summary of Bycatch Issues

This FMP continues to implement measures designed to minimize bycatch and bycatch mortality in all HMS fisheries, to the extent practicable. NMFS also intends to minimize bycatch and bycatch mortality of HMS caught incidental to other fishing operations. NMFS identifies the following issues as current particular bycatch concerns (in no particular order):

- Bycatch of bluefin tuna in the pelagic longline fishery
- Bycatch of undersized swordfish in the pelagic longline fishery
- Bycatch of billfish in the pelagic longline fishery
- Post-release bycatch mortality of all HMS in all hook and line fisheries; recreational and commercial.
- Bycatch of sharks in all fisheries, particularly prohibited species and juvenile sharks
- Bycatch of marine mammals in the pelagic longline fishery and southeast shark drift gillnet fishery
- Bycatch of sea turtles in the pelagic longline fishery and southeast shark drift gillnet fishery

Table 3.46 Observed takes of sea turtles in the 1993 - 1997 pelagic longline fishery by year, calendar quarter, and fishing area. Blank areas indicate no effort for that year, quarter, and area (based on NMFS observer data: less than 5 percent coverage in most years). Areas indicate statistical sampling areas for pelagic logbook data analyses (refer to Figure 3.13)

Year	Qtr	CAR	FEC	GOM	MAB	NCA	NEC	NED	SAB	SAR	TUN	TUS	**Total**
1993	1	1	1	8	0	1			0				**11**
1993	2	0	0	5	8		7	4	2				**26**
1993	3		0	1	4		10	19	2				**36**
1993	4	3	3	1	5		0	8	0				**20**
1994	1	2	0	8	0	1			0				**11**
1994	2		0	4	1		2		0				**7**
1994	3		2	1	4		4	46	0				**57**
1994	4		0	1	5		1	53	0				**60**
1995	1	0	3	0	1	6		0	0				**10**
1995	2	0	2	4	7	3			5				**21**
1995	3	0	1	0	7		5	57	0				**70**
1995	4		0	1	3		2	84					**90**
1996	1	0	0	0		3			1	1	1		**6**
1996	2		0	0					5				**5**
1996	3		0	3	3		2		0		0		**8**
1996	4	1	1	1	0				1				**4**
1997	1	3	0	2		2			2	1	1	2	**13**
1997	2			0	0			0	1			0	**1**
1997	3		1	0	1		3	6	0	1			**12**
1997	4		0	0	0		2		0				**2**
Total	**13**	**14**	**40**	**66**	**16**	**46**	**293**	**21**	**3**	**2**	**2**		

Table 3.47 A summary of bycatch in HMS fisheries.

Gear	MMPA Category[1]	# vessels in the fishery	Retained Species	Bycatch Species	Reason for Discards[2]	Significance of Bycatch[3]
Pelagic LL	I	198 directed 218 incidental (refers to swordfish limited access permit holders)	swordfish BAYS tunas bluefin tuna pelagic sharks large coastal sharks	BAYS tunas bluefin tuna undersized target species sharks billfishes turtles birds mammals	REG REG REG REG/DIS REG PS PS PS	low high high moderate moderate high low high
Bottom longline	III	211 directed 578 incidental (refers to shark limited access permit holders)	large coastal sharks small coastal sharks	undersized target other coastal species sea turtles	REG REG/DIS PS	high low moderate
Shark drift gillnet	II	12 to 15	large coastal sharks small coastal sharks	undersized target other coastal species protected species	REG REG/DIS PS	high moderate high
Harpoon/Swordfish	III	3 (in 1998)	swordfish	none	n/a	n/a
Harpoon/BFT	III	59 (as of 11.1.98)	BFT	undersized target	REG	low
Recreational rod and reel	n/a	approx 12,000	BFT BAYS tunas blue marlin white marlin sailfish sharks	*blue marlin*[4] *white marlin* *sailfish* sharks undersized target	REG REG REG REG REG	low low low moderate low
Commercial rod and reel	III	7000	BFT yellowfin tuna	undersized target blue marlin white marlin	REG	low
Purse seine	III	5	BFT BAYS tunas	tunas	REG	low

[1] Fishery category under the Marine Mammal Protection Act

[2] The reasons that fish are discarded in that fishery [regulatory (REG); discretionary/economic/personal considerations (DIS); or prohibited species (PS)].

[3] The significance of bycatch is based, partially, on "Managing the Nation's Bycatch", the NMFS bycatch plan. The explanation for these determinations begins on page 105 of that document (NMFS, 1998c).

[4] Released billfish are no longer considered as bycatch in the recreational fishery. The intention of the Magnuson-Stevens Act is to increase opportunities for recreational experience, and provided billfish survive a catch and release encounter, they will be available for another encounter. Therefore, in the Billfish FMP Amendment, NMFS establishes recreationally-caught billfish as a catch and release program. Nevertheless, some post-release mortality is associated with recreational billfish catch, whether they were released due to small size or a voluntary release. NMFS continues to support studies that examine the post-release survival of rod and reel caught HMS.

3.5.3 Management Measures to Address Bycatch Problems

3.5.4.1 Reducing HMS Bycatch and Bycatch Mortality

3.5.4.1.1 Bluefin Tuna

It is the intent of this FMP to reduce the incidental catch of bluefin tuna on gears that are not authorized to take bluefin. However, it is also the intent to reduce waste of unavoidably caught bycatch. See Section 3.5.2.1 for a description of bluefin tuna bycatch. Recently, NMFS has begun to collect and analyze discard data from other gear types. However, it is important to recognize that when comparing past estimates of dead discards reported to ICCAT to future estimates for detecting trends, the past estimates have, for the most part, only included dead discards from pelagic longlines. Therefore, it would be inappropriate to conclude that dead discards have not changed if the total estimate of dead discards were to remain at the same level, when the new estimate may include additional gear types. Refer to Table 3.48 for a summary of reported dead discards, quotas and landings of bluefin tuna for 1992 through 1997, as reported to ICCAT in the 1997 and 1998 National Reports of the United States to ICCAT.

During the 1980 winter/spring longline fishery for bluefin tuna in the Gulf of Mexico, a number of U.S. longline vessels fishing for swordfish began to land increasing quantities of giant bluefin tuna. NMFS was concerned that without immediate action there could be substantial investment in fishing gear and processing facilities by the U.S. industry in developing a directed longline fishery for bluefin tuna in the Gulf of Mexico, a known spawning area for bluefin tuna. There was also concern that under the regulations at the time, longline catches could severely and negatively impact the other fisheries in the Gulf of Mexico and mid-Atlantic areas. As a result of these concerns, NMFS published a final rule dated January 26, 1981 (46 FR 8012), which prohibited the use of longlines in a directed bluefin tuna fishery, prohibited a targeted bluefin tuna fishery in the Gulf of Mexico, implemented an incidental catch limit of bluefin tuna, and established two management areas north and south of 36 N where different catch limits would apply. South of 36 N, longline fishermen were restricted to two fish per vessel per trip, whereas north of 36 N, they were restricted to two percent by weight of all other fish on board at the end of the fishing trip.

In 1982, ICCAT recommended a ban on directed fishing for bluefin tuna in the Gulf of Mexico to protect the spawning stock. This action primarily impacted Japanese longline fishermen in the area, as U.S. longline gear had already been prohibited from targeting bluefin tuna in the Gulf of Mexico. However, concern remained over the adequacy of the incidental catch limits, particularly regarding the efficiency of the restriction at reducing bycatch and discards of bluefin tuna. NMFS' examination of available longline fishery data regarding discarded bluefin tuna in the

Gulf of Mexico revealed that more than 80 percent of those bluefin tuna released were dead.

On January 6, 1992 (57 FR 365), NMFS determined that the incidental catch limit in the south was not effective at reducing bluefin tuna bycatch and changed the restriction for this area. Until that time, the bycatch restriction of up to two bluefin tuna per trip, without any requirement that the bluefin tuna be landed in conjunction with other species, and the short distance from shore to the fishing grounds, made it feasible for vessels to direct their fishing on bluefin tuna, despite the retention limit. As this activity ran counter to the intent to prohibit directed fishing of bluefin tuna by longline gear the final regulations required longline vessels operating in the southern area (south of 36   N) to land, offload and sell at least 2,500 pounds of other species as a condition for landing a maximum of one bluefin tuna. After this action, NMFS received several comments indicating that the new bycatch restriction in the southern area caused an increase in bluefin tuna discards and waste. NMFS conducted scoping meetings on this issue and examined several options that included: 1) requiring special gear; 2) requiring a minimum number of days between a vessel's landings; and 3) review the minimum target catch requirements. Recommendations also included prohibiting bluefin tuna catches in the Gulf of Mexico or, conversely, working through ICCAT to rescind the prohibition and allow limited directed fishing.

On January 19, 1994 (59 FR 2814) NMFS proposed to amend the minimum landing requirements that changed by time of year. At that time NMFS maintained that it was possible to conduct directed fishing on species other than bluefin tuna, with only a limited amount of bluefin tuna catch. However, NMFS also stated in this *Federal Register* notice that "if evidence indicates this is not true, NMFS may consider more stringent measures, such as area or season closures or gear restrictions, in future rulemaking." On April 14, 1994 (59 FR 17723) NMFS published a final rule that changed the directed fishery minimum weight requirement on landing one bluefin tuna, for the southern area only, from at least 2,500 pounds to 1,500 pounds during the months from January to April, and to 3,500 pounds from May through December. Catch restrictions remained the same for the northern area.

At the same time as NMFS modified the landings requirements, NMFS also modified the geographic separation between the northern and southern management areas by adjusting the dividing boundary south to 34   N (59 FR 17723, April 14, 1994). This was primarily because the previous location at 36   N was located in a particularly dynamic oceanographic area where vessels fishing on one side of the line may find themselves transported by currents to the other side. This division line adjustment prompted comments regarding division of quota and specification of landings requirements affecting the northern and southern subcategories of the incidental longline category.

In addition, NMFS received numerous written comments that the landings requirements applicable in the northern area cannot be met by vessels in the shark longline fisheries operating off of North Carolina in the winter months, due to the retention limits in effect under the shark fishery management plan. Participants in this winter shark fishery have noted that the bluefin tuna and shark regulations, taken together, force discarding of bluefin tuna, e.g., the 4,000-mt dw LCS retention limit allows retention of only 80 lb ww of bluefin tuna. These fishermen requested an allowance to land and market fish that would otherwise be discarded dead, thus increasing boat revenues without contributing to additional bluefin tuna mortality. Also, despite these ongoing efforts to reduce discards by changing target catch requirements and geographic areas, U.S. bluefin tuna dead discards increased in 1995 to a total of approximately 142 mt (U.S. National Report to ICCAT, 1997).

In response to these comments, and the relatively high number of discards reported to ICCAT, NMFS undertook a review of the bluefin tuna incidental catch regulations, including division of the quotas, position of the dividing line between the northern and southern subcategories, and landing criteria applicable to each management area. Observer data from longline trips taken from 1991 to 1994 indicated that two or fewer bluefin tuna were hooked on 91 percent of all observed trips. NMFS also analyzed landings information to determine trends in landings by time and area. NMFS published the results of its review in an Advanced Notice of Proposed Rulemaking (ANPR), published on September 17, 1996, (61 FR 48876).

The ANPR requested public comments on possible changes to the regulations to reduce incidental mortality of bluefin tuna while allowing for commercial use of unavoidable bycatch. Various proposals were presented and several public comments were received during the comment period on the ANPR. Many of the proposals called for various changes to the catch limits and/or moving the dividing line between management areas while other comments raised concern over providing an incentive for a directed fishery and advocated use of time/area closures to address the problem of discards.

In response to the 1996 ICCAT recommendation that called for the United States to adopt measures designed to reduce discards of bluefin tuna during 1997 and 1998, and since publication of the ANPR and receipt of comments, NMFS examined different options for reducing dead discards. NMFS considered a variety of options, including changing the current target weight requirement, limiting the number of days per trip, and implementing time/area closures. Logbook and dealer weighout slips from 1991 through 1995 were collected, and initial results indicated significant differences between the number of bluefin tuna caught and discarded per trip by season and region.

Analyses of bluefin tuna discard data continued through 1998, the preliminary results of which were presented to the HMS and Billfish APs in March and July

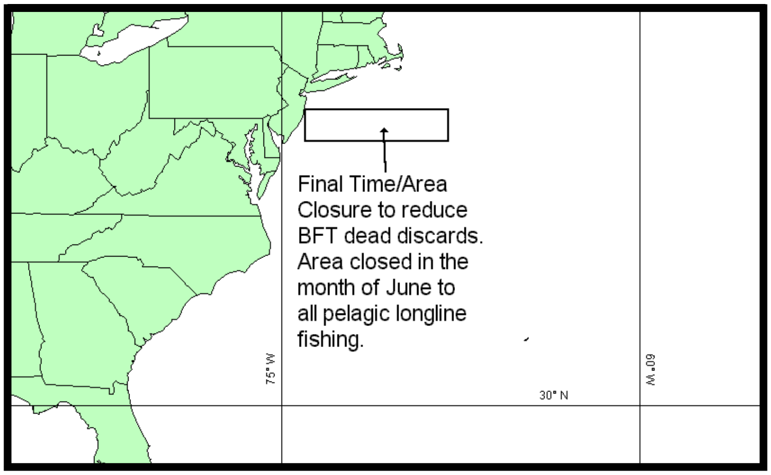
1998. The 1998 ICCAT Recommendation on west Atlantic bluefin tuna requires that all Contracting Parties, including the United States, minimize dead discards of bluefin tuna to the extent practicable. The Recommendation also established a 79-mt allowance for dead discards for the west Atlantic, of which the United States was allocated 68 mt. If a country has dead discards in excess of their allowance, they must be counted against that country's landing quota for the following year. If there are fewer dead discards, then half of the underharvest may be added to the following year's quota while the other half is conserved. For any of the following alternatives, if NMFS determines that the United States' annual dead discard allowance has been exceeded, NMFS would subtract the amount in excess of the allowance from the total amount of bluefin tuna that can be landed. If NMFS determines that the annual dead discard allowance has not been reached, NMFS may add one half of the remainder to the total amount of bluefin tuna that can be landed.

Other measures adopted by NMFS in the FMP (e.g., prohibiting driftnets for Atlantic tunas other than bluefin, limited access for sharks and swordfish, and reduced quotas for sharks and swordfish) may contribute to reducing dead discards of bluefin tuna. In addition, the recent final rule issued by NMFS prohibiting the use of driftnets for swordfish may contribute to the reduction of bluefin tuna discards.

Final Action: Closure of area to pelagic longline fishing in June

This action implements a prohibition of the use of pelagic longlines in the Northwestern Atlantic from 39 to 40 N and 68 to 74 W during June (See Figure 3.5.1). NMFS chose this alternative after the completion of analyses on nine different time area closure options on logbook data ranging from 1992 through 1997 (see Appendix 6). This is different from the preferred alterative published in the bluefin tuna Addendum, which called for the closed area to be from 37 to 41 N and 70 to 74 W. Comments from the longline industry stated that there was little interaction with bluefin tuna in the southern half of the proposed area. After re-examination of the logbook data, a discrepancy was found with the original analysis, and new analyses show that an equivalent reduction in discards can be achieved by closing a smaller area that is consistent with requests from the longline industry.

Figure 3.8 Time/Area closure to reduce discards of bluefin tuna in the pelagic longline fishery.



The challenge of time/area closures is to determine times and areas that will effectively meet the goal of minimizing bluefin tuna dead discards while having the least impact on the directed fisheries over a long period of time. It may be necessary, based on physical oceanographic data, to change the timing and location of the closure from year to year or from month to month. However, it would be difficult to accurately identify areas and times and implement closures that change from year to year. Therefore, a wide range of options was considered. Temporal closure alternatives extended from a monthly closure to a year-round closure. Spatial alternatives extended from two by two degree squares to an eight by four degree rectangle. Analyses of logbook data indicate that: 1) at certain times of the year, high levels of discards (dead and alive) can be expected in particular areas; 2) only a few sets catch large numbers of bluefin tuna; and, 3) the location and timing of these discards vary over time and space. This fluctuation in time and space may be due to the variability of the natural environment, particularly the location of the northern edge of the Gulf Stream. A more detailed description of the analyses performed, the results, and a discussion of the rationale for adopting this alternative can be found in Appendix 6.

Ecological Impacts

The action will have direct positive ecological impacts on bluefin tuna by prohibiting longline activity in a one by six degree area during the month of June where a high number of bluefin tuna discards have been reported. This time/area closure is predicted to reduce total U.S. discards of bluefin tuna by longline vessels by approximately 55 percent within the entire area and thus reduce fishing mortality of bluefin tuna (Appendix 6)[3]. This may have a positive impact on bluefin tuna and assist with other ongoing efforts to rebuild this fishery. The analysis of this time/area combination includes an accounting of the indirect effects of displaced effort to areas outside the closed area in June. Results show that the increased effort in adjacent areas is predicted to cause a slight increase in the rate of bluefin tuna discards in these new areas, although overall it is predicted that discards will significantly decrease. The impact on target fisheries such as swordfish, tunas other than bluefin, and sharks is difficult to ascertain. Appendix 6 provides an analysis of estimated catch rates of other species if vessels displace to areas adjacent to the study area. These analyses predict that landings of tuna (other than bluefin) might decrease on the order of two percent, whereas landings of other target species might actually increase. Since the swordfish and shark fisheries are managed under a quota, it can be assumed that the fishery would continue until the quota is reached, albeit in different areas. Thus it is possible that there would be no net change in the overall impact to swordfish or shark stocks. It is possible, however, that movement of the vessels away from the time/area closures may mean that different size classes of swordfish or sharks are caught. Swordfish is classified as overfished, and a minimum size of 29 inches CK (or 33 pounds dressed weight) is in place to protect small fish. Large coastal sharks are also classified as overfished. This FMP implements a minimum size of 4.5 feet fork length on ridgeback sharks. There are no commercial minimum sizes established for other shark species. There are no quotas on the other tunas, although there is a minimum size on yellowfin and bigeye tuna of 27 inches CFL.

The closure of certain areas and times to reduce discards of bluefin tuna may have an impact on species such as marine mammals, turtles, and seabirds that are distributed throughout the study area. Observer and logbook data indicate pelagic longline interactions with these protected species, particularly sea turtles. Closure of the proposed areas to the longline fleet could have a positive impact on these species by removing the potential for interaction with longline gear. However, as it is possible that longline fishing activities will be displaced to other areas, any benefits accrued in the closed area may be offset by increased interactions in the new areas fished. The displacement model predicts that if vessels are displaced from the one by six degree area in June, then landings of turtles could either increase by eight percent or decrease by six percent relative to the status quo depending on the year in question (Appendix 6). These results are variable because of the low interaction rate of this gear with turtles. Given the low level of interactions between this gear type and these protected species, the final action is not expected to have any significant impact on sea turtle stocks. The interaction between pelagic longline gear and marine mammals is significantly less than that for sea turtles (Johnson *et al.*, 1999).

[3] In 1997, the pelagic longline fleet discarded a total of 37.1 mt ww dead bluefin tuna in the Atlantic and Gulf of Mexico, 30.7 mt ww of which were discarded dead in the northwest Atlantic. If the anticipated 55 percent reduction in bluefin tuna discards in the northwest Atlantic is applied to the 1997 figures, NMFS estimates that the total amount bluefin tuna dead discards for the pelagic longline fleet in 1997 would have been 20 mt ww.

Thus, this final action is not expected to have any significant impact on marine mammal stocks.

Once implemented, NMFS will evaluate the efficacy of this closure in reducing bluefin tuna dead discards, given the distribution of bluefin tuna and the expected redistribution of fishing effort. NMFS will monitor impacts to the users of pelagic longline gear to determine what, if any, future action or modifications to the proposed time/area closure may be necessary. Such actions could be accomplished by regulatory amendment under the framework procedures of the HMS FMP.

Social and Economic Impacts

Although this time/area closure is expected to reduce the number of bluefin tuna discards in the longline fishery, it is not expected to have a significant impact on landings of target species such as sharks, swordfish, and other tunas. The predicted negative impact for this action is greater, however, than that predicted for the previously preferred four by four degree time/area closure. This is due to the fact that the selected closed area is one in which more concentrated longline fishing effort takes place. If fishermen decide to displace effort to other areas, fishing costs for fuel, bait, and ice may increase. In addition, travel time may increase. However, NMFS does not expect this possible increase in fishing costs for the short period of time of the closure to have a significant impact on small entities, especially since commenters asked for this smaller area. This time/area closure may also have an impact on entities such as seafood processors and tackle shops in that area. However, fishing effort will be displaced to other locations, NMFS does not believe that this action, given its short time-span, will adversely impact these communities.

There are potential concerns regarding the safety of human life at sea associated with a time/area closure in the north Atlantic during June. NMFS received comments that the initially proposed four by four degree closed area would force vessels to fish in, and travel through, a dangerous area of the Gulf Stream. This was a particular concern for some of the smaller vessels which would have to travel a larger area even though the fuel capacity of their vessels would not increase. The modification of the closed area to the selected one by six degree area should mitigate some of these concerns especially since the selected one by six degree area does not include the dangerous area referred to in these comments.

Time/area closures can also be costly, difficult to administer, and difficult to enforce. Use of a vessel monitoring system (VMS) can reduce the substantial enforcement costs of a time/area closure. With the use of a well-designed VMS program, enforcement can be made more efficient without sacrificing effectiveness. Use of VMS can increase compliance with the closure and increase net revenues to fishermen by enabling the agency to monitor the real-time locations and, in some cases, fishing patterns of many vessels at any time, thereby allowing otherwise prohibited activities. This FMP requires VMS on all pelagic longline vessels.

The design of the closed area has been chosen, in part, to assist with enforcement. Enforcement resources, in terms of overflights and at-sea patrols, would be necessary to ensure that longline fishing is not taking place in the closed area and time. Deployment of these assets could be combined with current operations and thus not incur any additional costs. This FMP requires VMS for all pelagic longline vessels, which should reduce any additional burden and mitigate enforcement operational costs. This would also allow longline vessels to transit the closed area. Other than the enforcement costs of monitoring the closed areas, there are not expected to be additional administrative costs from this option.

Conclusion

This final action will allow NMFS to minimize bluefin tuna dead discards while also minimizing the economic and social impacts on fishermen.

Rejected Options for Reducing Bluefin Tuna Bycatch Mortality

Rejected Option: No action (status quo)

U.S. reports to ICCAT show an increase in dead discards in the longline fishery between the years of 1995 and 1997. These dead discards were decreased from 141.6 mt in 1995 to 37.1 mt in 1997. Quota reductions for the fisheries in which bluefin tuna are bycatch (i.e., the swordfish quota was reduced by 30 percent from 1992-1998, and the large coastal shark quota by 50 percent in 1997), have affected overall longline discards of bluefin tuna particularly during closures of these fisheries. Thus, the status quo resulted in the incidental category landing fewer bluefin tuna than have been allowed in recent years. Subsequently, the remaining quota has been transferred from the Incidental category to other categories.

Ecological Impacts

Under this alternative, NMFS would not take any further action, beyond that proposed in the draft HMS FMP, to implement the ICCAT recommendation to minimize dead discards of bluefin tuna to the extent practicable. Thus, no additional ecological impacts would be expected from this alternative. Although recent NMFS actions impacting the longline fishery have had the additional effect of reducing bluefin tuna discards, no additional actions would be taken to reduce bluefin tuna discards. The reduction in quotas for other species targeted by pelagic longline vessels adopted in this FMP (swordfish and sharks), along with the limited access system implemented for swordfish and sharks, however, may have the added effect of reducing dead discards of bluefin tuna.

Under status quo, fishing patterns would not be expected to change beyond what it would under the other preferred alternatives in the draft HMS FMP which affect the pelagic longline fishery, and thus interactions with marine mammals and protected species would not be expected to change as a direct result of this alternative. Currently, the longline fishery is classified as a Category I fishery under the MMPA. Longline gear incidentally catches turtles as well as some seabirds and interacts with certain marine mammal species.

Social and Economic Impacts

Currently the USCG conducts routine overflights of the study area as part of enforcement and safety patrols. NMFS Enforcement officers conduct enforcement operations throughout the study area. NMFS Port Agents monitor dealer reports in the Northeast region and vessel trip reports are sent directly to NMFS in the Southeast Region for sharks and swordfish. Fishing activity is not expected to change beyond what it would under the other final actions in the FMP that affect the pelagic longline fishery. As such, no additional economic impacts would be expected as a direct result of this alternative.

Conclusion

Under this alternative, no additional action would be taken by NMFS to minimize bluefin tuna bycatch, beyond the other preferred alternatives in the draft HMS FMP which affect the pelagic longline fishery. This alternative may not directly result in further bycatch reductions beyond those already achieved, but dead discards of bluefin tuna may decline due to other measures in the FMP or due to voluntary measures taken by the pelagic longline fleet.

Rejected Option: Change catch limits

Under this alternative, target catch requirements to land a bluefin tuna would be modified in an effort to reduce discards in the longline fishery. The catch limit could be made more restrictive to further reduce any incentive to target bluefin tuna and avoid areas and times of high bluefin tuna concentration.

Analyses of databases show no relationship between target catch and the number of bluefin tuna discarded. This is expected if the fishery is truly incidental. Figures 3.7 and 3.8 indicate this lack of relationship between target catch and the number of bluefin tuna caught. These figures are included at the request of many commenters. Without any firm relationship between target catch and discard rate there is no basis for modifying target catch regulations. However, since data have been processed on a trip basis since 1996 only, future database analyses may provide guidance for a change in the target catch regulations. NMFS will continue to work with the HMS AP to consider such analyses in the future.

Figure 3.9 Figure showing the relationship between the number of bluefin tuna caught versus the number of target fish caught per trip in 1996. Each triangle or square indicates a trip in 1996 on which bluefin tuna were caught.

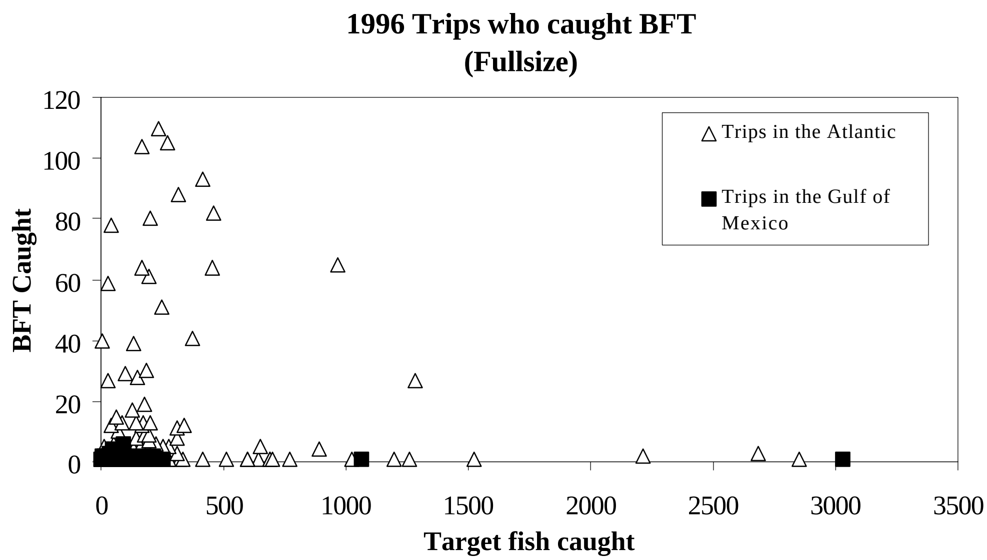


Figure 3.10 This is an enlarged view of the lower left hand corner of Figure 3.9. Each triangle or square indicates a trip in 1996 on which a bluefin was caught.

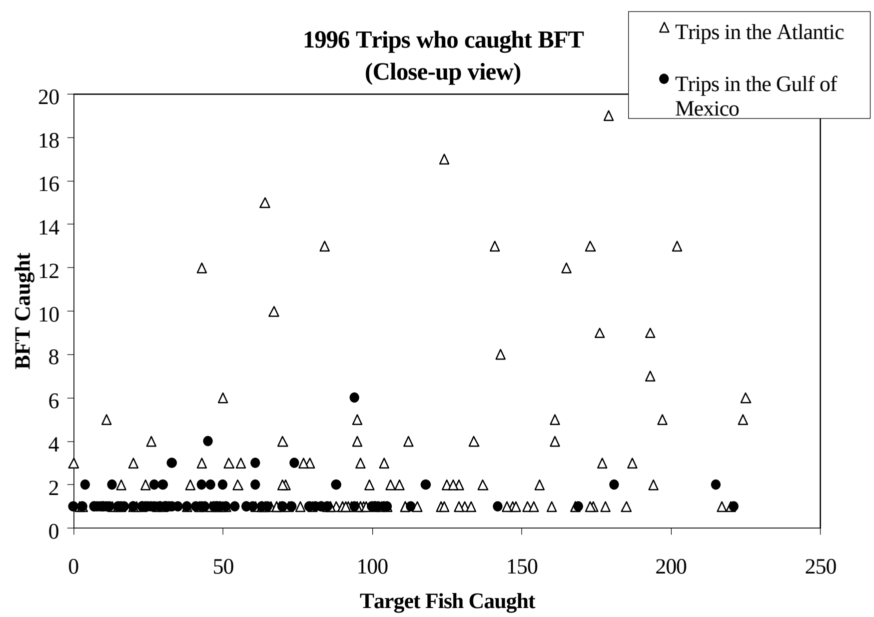


Figure 3.11 Figure showing the relationship between the number of bluefin tuna caught versus the number of target fish caught per trip in 1997. Each triangle or square indicates a trip in 1997on which a bluefin tuna was caught.

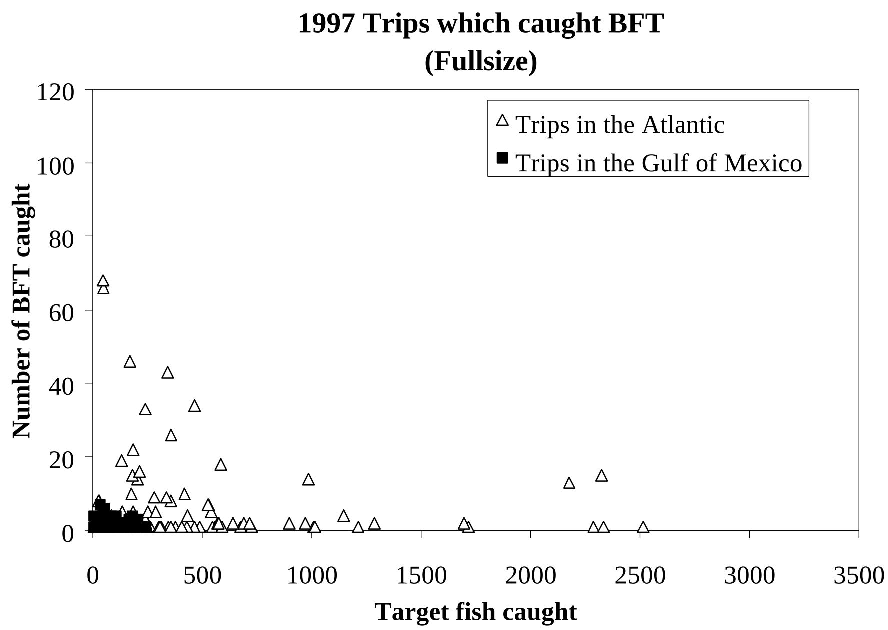
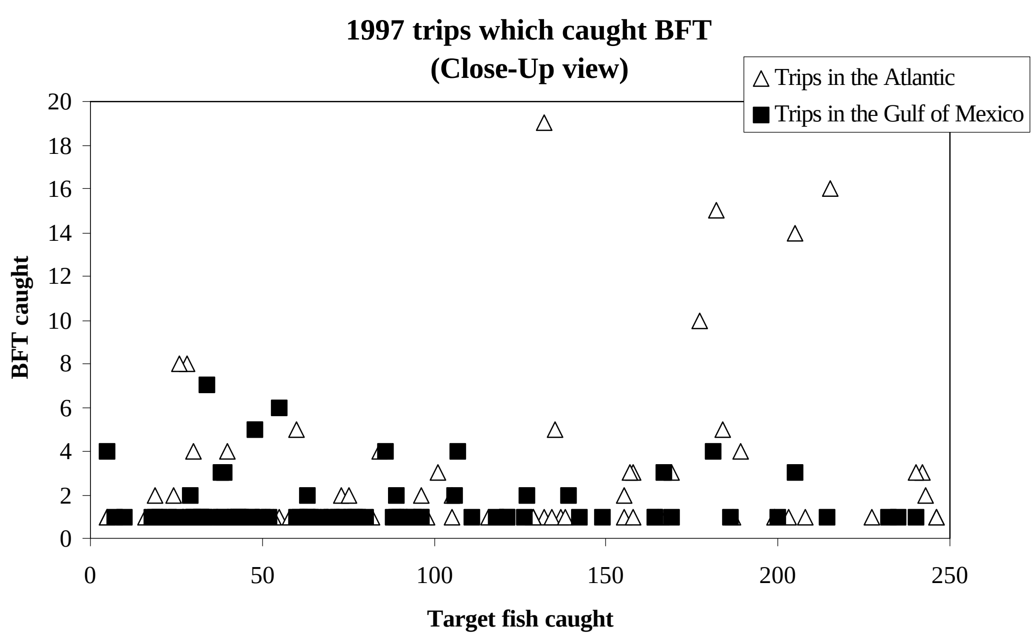


Figure 3.12 This is an enlarged view of the lower left hand corner of Figure 3.11. Each triangle or square indicates a trip in 1997 on which a bluefin tuna was caught.



Ecological Impacts

The current regulations could be changed to increase the amount of target catch required before a bluefin tuna could be retained. This may provide further incentive to avoid bluefin tuna, but could potentially increase discards due to the greater catch requirements of target species. Conversely, the regulations could decrease the amount of target catch required, which would make it easier to retain bluefin tuna caught. This could reduce discards but could also provide an incentive to fish in areas where bluefin tuna were more likely to be caught. Neither increasing the catch requirements nor decreasing the catch requirements would address the problem of the few sets that occasionally catch large numbers of bluefin tuna. Analyses show that there is little to no relationship between the target catch amounts and the numbers of discards (Figures 3.7 to 3.10), lending support to the characterization that the bluefin tuna caught are only incidental to target fishing operations. Thus, changing the target catch requirements alone in this incidental fishery would not directly address the problem of bluefin tuna discards.

If incidental catch limits were increased, then fishermen would need to increase the catch of other target fish stocks to land any bluefin tuna they may catch. This could potentially negatively impact target stocks. If catch limits were decreased, the converse would be true and target stocks maybe positively impacted. If however, a target fishery is quota limited, then target fisheries would continue until the quota is attained, regardless of the incidental catch limit. Finally, in a truly incidental fishery there should be no motivation to target bluefin tuna, so regardless of the catch limits there should be no effect on target effort or catch.

Changing the catch limits would probably have no impact on protected species interactions except to the extent that changes in target catch limit requirements affect vessel behavior. If target catch requirements are set at appropriate levels, fishing effort on target species would continue at a comparable level to the status quo. Only the amount of bluefin tuna that vessels may retain would change.

Social and Economic Impacts

Increasing or decreasing the target catch limits could have a range of social and economic impacts. If the catch limits were increased, fishermen could land an additional amount of target fish along with bluefin tuna. This would have immediate benefits for each trip. However, if the target fishery is limited by a quota, this additional amount landed per trip could reduce the season. In the long term, this could have a greater negative impact on the fishermen as income over the entire year would not be constant.

If the catch limits were decreased, fishermen would not need to catch as many target fish to land a bluefin tuna. This would also have immediate benefits for each trip. The fishermen could have fewer days at sea, buy less bait, ice, and fuel, and have more trips each year. However, if reducing the catch limits creates a target fishery on bluefin tuna, this option could be devastating in the long term if fishermen begin to rely on an overfished species.

The regulations governing catch limits are already divided by geographic area and further subdivided by season. Additional changes to the regulations may provide an extra level of complexity to the catch limit regulations that could burden enforcement and require additional education to fishermen. Monitoring of the incidental catches may also be more burdensome due to the need for finer scale quota monitoring.

Conclusion

Analyses do not indicate any correlation between catch limits and bluefin tuna discards. Thus, this alternative does not meet the goals of the FMP and is rejected.

Rejected Option: Canadian time/area closure regime

At the HMS AP meeting held in March 1998, NMFS was advised to consider the regime used by Canada for the time/area closure in the Canadian swordfish longline fishery to eliminate bluefin tuna bycatch. Below is a brief description of the regulatory background and procedure implemented by Canada as outlined in the Canadian Swordfish Management Plan and via personal communication with Chris Allen, Canadian Department of Fisheries and Oceans (DFO), March 1998.

In July 1994, at-sea boardings of swordfish longline vessels indicated high levels of bluefin tuna bycatch, particularly along Brown's and Georges Banks. Since high mortalities of bluefin tuna discards were observed by Officers of Canada's DFO, the DFO closed the swordfish longline fishery west of a line drawn due south of 65 30' W from Baccaro Point (southwest of Nova Scotia) to the eastern edge of the Northwest Atlantic Fisheries Organization Convention Area. DFO conducted a series of observer-monitored test fisheries throughout the summer fishery until early fall. Once the bluefin tuna bycatch ceased to be a problem, the area was reopened to swordfish longline fishing.

Based on this experience, the industry proposed a Conservation Harvesting Plan, which included an annual closure for swordfish longline fishermen west of 65 30' W until August 1, with a provision to conduct test fisheries with observers aboard during the closure period. Because of the selective nature of the swordfish harpoon fishery, this closure did not apply to these vessels. In addition, industry and DFO jointly created a "Contingency Protocol" with the objective of establishing conservation criteria, action options and test fishery elements. This protocol has been incorporated into the Canadian Swordfish Management Plan since 1995. In 1997, two vessels conducted test fisheries under the Protocol and, as a result of their catches, the area remained closed until August 10. After August 10, the area west of 65 30' W was reopened, but all vessels had to carry an observer, at their own expense, in order to closely monitor all haul-backs.

In 1995 and 1996 the opening of the Canadian swordfish fishery was delayed until August 1 west of 65 30' W to avoid the problem of bluefin tuna bycatch. The Canadian Atlantic Fishery Regulations stipulate a zero tolerance of bluefin tuna bycatch. Closure will occur should this be exceeded based on observations from either at-sea inspections by Fisheries and Oceans Canada (DFO) or by at-sea observers. DFO consults with large pelagic participants to determine whether the fishery should continue at a reduced level of activity with a high level of observer coverage, or whether to close the fishery area for a specific time period and implement a comprehensive test fishery, or close the fishery for a specific time period and conduct no test fishery. The participants in the fishery determine which vessels may participate in the test fishery and vessel operators are responsible for all observer costs for the duration of the test fishery.

Ecological Impacts

The Canadian model for time/area closures may also help reduce discards of bluefin tuna and have a positive impact on the stocks. The intent would be similar to the final action described above. A time/area closure would be implemented when large numbers of bluefin tuna are believed to be on the fishing grounds. In contrast to the final action, determination of the appropriate time/area closure would be done by vessels testing the closed area to ascertain when the bluefin tuna have left the area so that traditional target longline fishing can resume.

The Canadian time/area closure model could also be used to monitor the abundance and distribution of marine mammals or other protected species in a certain test area so that fishing effort would only be allowed when the area is clear of these species. This alternative could potentially reduce interaction rates with protected species although it is not used in this fashion.

Social and Economic Impacts

Canada requires observer coverage at the expense of the longline fishermen involved. If implemented for the United States, this alternative would present an additional economic burden to the fishery as well as an additional administrative burden for the government because of openings/closings based on test results. The Canadian model also assumes that once the test boats have determined that bluefin tuna have migrated out of the test area, the fish will remain out of the area long enough for normal fishing operations to take place. Whereas this may be a good assumption for bluefin tuna migrations in the northern Canadian waters, it may not be applicable in the waters of the U.S. continental shelf where migration patterns are less predictable. Finally the Canadian system may be more appropriate for a fishery in which industry routinely pays for observer vessels, and for fleets of relatively modest size. For the U.S. pelagic longline fleet, guaranteed ten percent observer coverage would cost up to $2.5 million per year.

In addition, this alternative would not allow fishermen to plan their fishing season. Under this alternative, fishermen would not know when the fishery may open or close. As such, plans for buying bait, fuel, ice, and other equipment would impact not only fishermen, but also the communities which rely on these sales. Also, unlike the final action, this alternative would not allow fishermen to displace effort as easily.

In addition to the costs of monitoring the area to determine when is an appropriate time for opening, enforcement would be necessary to oversee the fishery while in progress. On-going monitoring of catches and quota would continue as normal.

Conclusion

This alternative is unduly harsh to fishermen and the communities which rely on fishing. In addition, this alternative would create a large administrative burden. As such, even though this alternative may decrease bluefin tuna discards and bycatch, it is rejected.

Rejected Option: Closure of all longline fisheries once any HMS quota is reached

Under this alternative, NMFS would prohibit pelagic and bottom longlines for all species, for the remainder of the season, regardless of where and when fishing occurs, once any single quota for any HMS species is attained (quotas are in place for directed longline fishing of sharks and swordfish, and an incidental (now called longline) quota for bluefin tuna). For example, the quota of incidentally caught bluefin tuna would remain as established each year for longlines with no catch limits or seasonal restrictions. Once the bluefin tuna quota for longlines was attained, pelagic longlines would be prohibited in all areas. The same would be true if the shark or swordfish quota was met first: longlines would be prohibited for that quota season.

This measure could be difficult to implement and enforce due to different seasonal openings and closures of the various affected fisheries. Also, because longline discards are estimated as reported (using reported numbers multiplied by observed weights), this alternative might increase the incentive to under-report discards, thus necessitating increased observer coverage. If all bluefin tuna caught were landed, bluefin tuna discards would be reduced to zero as all bluefin tuna could be retained until the quota was met. This regime could potentially have a benefit of reducing incidental mortality of billfish, undersized swordfish, and sharks due to early closure of the entire longline fishery for all species. However, if the bluefin tuna quota, or any other quota, were met rapidly at the beginning of the directed fishery for any species (including swordfish, sharks or tuna other than bluefin tuna), there could be significant economic disruption for all of the fisheries. Also, this alternative would not utilize the entire quota of those fisheries that were not met first, which would be counter to the intent of ATCA and the Magnuson-Stevens Act to provide U.S. fishermen an opportunity to harvest the full quota.

Ecological Impacts

Closing the entire longline fishery once a quota has been reached in any HMS longline fishery may have a positive impact on bluefin tuna. All bluefin tuna caught could be landed until the quota was reached, unless a quota for another fishery was reached first. Thus, potentially there would be no dead discards of bluefin tuna and potentially the allocated quota may not even be caught if the quota of another fishery (i.e., sharks or swordfish) was caught first. However, if bluefin tuna that would normally have been released alive are now retained, some of the positive impacts would be diminished.

Closing all longline fisheries once any individual fishery quota is reached could have an impact on target stocks depending on which fishery closed first. Once the longline fishery is closed after reaching a certain quota then all other target species would be relieved from any additional fishing pressure - until the opening of the next quota period. Target stocks may be positively impacted if fishing mortality was reduced as a result of a closed longline fishery. However, this alternative could cause a large race-for-the fish in which fishermen try to land as many fish as possible of all species before the fishery closes. This could increase bycatch and discards of many species. Closing all longline activities once any quota is reached could reduce interactions with protected species, but the magnitude of that potential effect is uncertain.

Social and Economic Impacts

This alternative would have a significant negative impact on fishermen. While the fishery for some species currently remains open for most of the season (i.e., swordfish) other fisheries close after only a few weeks (i.e., large coastal sharks). Thus, this alternative would close all fisheries, preventing fishermen from switching fisheries once a quota is reached. The possible decrease in income, and the unsteady nature of the fishery not only may force fishermen out of business, but also may affect the communities which rely on those fisheries.

This option could require additional enforcement and monitoring costs to ensure that discards are properly reported and deducted from the quota. Currently, discards are self-reported on vessel trip reports. If some limited government-funded (versus fishery-funded) observer coverage were to be implemented to independently verify discard amounts, then administrative costs would increase. Other administrative issues include whether the discards are deducted from the longline or total quotas. There may be some additional burden on administrators to quickly and accurately compile discard numbers from the previous year to ensure the correct amount is deducted in time. In addition, if this alternative increases the race-for-the-fish, safety at sea could decrease as fishermen may be more intent on bringing in large amounts of fish quickly than in paying attention to the safety of the vessel and crew.

Conclusion

This alternative could have large negative ecological and economical impacts. In addition, it may decrease safety-at-sea. Thus, this alternative is rejected.

Table 3.48 Total U.S. quotas and landings; longline category landings, quotas, and dead discards of bluefin tuna, in metric tons whole weight, 1992 - 1997.

		1992	1993	1994	1995	1996	1997
A	**Total U.S. Quota[1]**	1,272.0	1,331.0	1,235.0	1,335.0	1,306.0	1,344.0
B	**Total U.S. Landings[2]**	1,084.5	1,238.1	1,162.9	1,309.7	1,284.1	1,333.6
C	**Longline Quota[1]**	132.0	83.0	109.0	123.0	109.0	109.0
D	**Longline Landings[2]**	135.6	88.5	101.6	72.6	67.9	49.8
E	**Longline Dead Discards[2]**	43.9	30.0	75.3	141.6	73.5	37.1

[1]From *Federal Register* notices setting quota allocations, 1992 through 1997. Longline Quotas are initial quotas; in some years the longline quota was reduced or increased due to transfers from or to other categories.

[2]From 1997 and 1998 U.S. National Reports to ICCAT.

3.5.4.1.2 Swordfish Bycatch Reduction Measures

NMFS establishes measures in this FMP that are likely to reduce bycatch of swordfish in HMS fisheries. In some cases, bycatch reduction measures may be developed in the future through the FMP framework. Those near-term and long-term measures that may directly or indirectly minimize bycatch include: bycatch limits, limited entry, gear modifications, minimum size, retention limits, time/area closures, and a process for accounting for dead discards of swordfish. In this section, NMFS considers time/area closures as a complement to the current swordfish minimum size requirement as a way to reduce bycatch of undersized swordfish and to foster rebuilding of this overfished stock. NMFS has also considered gear modifications and educational workshops and materials.

Specifically, NMFS seeks to minimize bycatch of undersized swordfish in the pelagic longline fishery. Having the current size limit in place may decrease landings of small swordfish, but may not decrease catches and reduce mortality without complementary management measures. Time/area closures would reduce fishing effort in nursery areas, thereby decreasing catch rates of, and the mortality rate for, undersized swordfish. However, NMFS must consider the effect of time/area closures on optimum yield.

NMFS developed alternatives to reduce bycatch of undersized swordfish with two goals: 1) to effectively reduce mortality on small swordfish and 2) to minimize impacts to fishermen. There is currently no incentive to target undersized swordfish, given the minimum size limit and the lower market price for smaller swordfish. Although swordfish discards have decreased in 1997 from prior levels (Table 3.49), pelagic longline fishermen have been unable to reduce discards sufficiently with voluntary measures such as gear modifications and voluntary avoidance of concentrations of small swordfish.

Table 3.49 Total U.S. quotas and landings/discards of north Atlantic swordfish, in metric tons, 1995 - 1997 (SCRS, 1998a).

	1995	**1996**	**1997**
Total U.S. Landings	4025	3562	2976
Total U.S. Discards	1644	588	446
Longline Landings	3926	3457	2569
Longline Discards	526	562	434

One consideration in developing a time/area closure program is whether to select small areas for long periods of time, or large areas for shorter periods of time. Closing small geographic regions to fishing may reduce mortality of small swordfish and billfish. However, if vessels were allowed to traverse these areas and fish in adjacent waters, it would be expected that mortality reductions caused by the time/area closure could be offset by increased mortality on the same stock in adjacent waters.

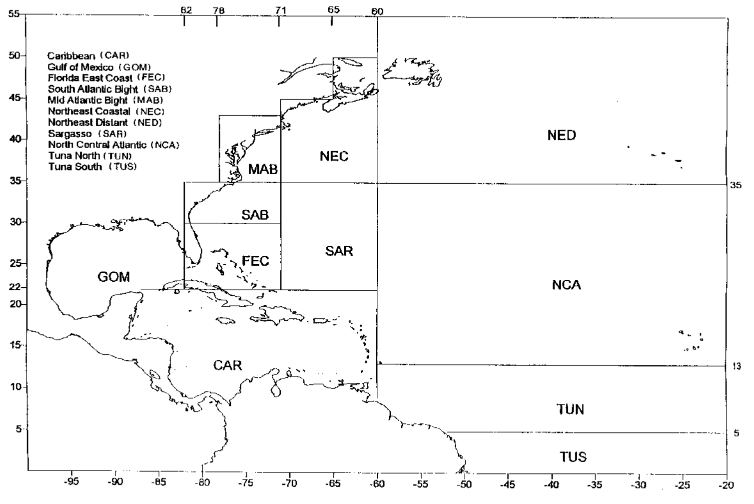
An analysis by Cramer and Scott (1998) of pelagic logbook data (1992 to 1996) submitted by pelagic longline fishermen, considered quarterly swordfish discard ratios (swordfish discarded/swordfish discarded plus swordfish landed) in two degree squares in the Atlantic Ocean, Gulf of Mexico, and Caribbean Sea. The Florida Straits ranked as the area of highest discards in the second and third quarters (April to September) and the area of the second highest discards in the first and fourth quarters (Cramer and Scott, 1998) and is therefore a priority area for protecting small swordfish. The swordfish discard ratio ranged from 29 percent to

60 percent in the Florida Straits during the third quarter for each year between 1992 and 1996. The Charleston Hump area south to the Florida keys represents a larger area that may act as a continuous nursery area for swordfish. Discards per unit effort vary widely within regions and seasons.

Figure 3.13 illustrates statistical areas used in analyzing data collected from pelagic longline logbooks. In 1997, 2,458 swordfish (approximately 82,720 pounds or 37 metric tons) were discarded dead during the third quarter from pelagic longline vessels operating in the area east of the Florida East Coast (Cramer and Adams, 1998a). Post-release survival is not estimated for the live releases, however, it can be assumed that some fraction of all swordfish released from a hook die. Although effort was lower in the Florida East Coast area (fewer hooks) than in the mid-Atlantic Bight and Northeast Coastal areas, more swordfish were discarded dead in 1997 than in these other areas. The South Atlantic Bight has similarly high rates of discard in the third quarter and is also of concern in the fourth quarter, given reduced fishing effort but high dead discards. NMFS therefore, proposed closing only the Florida Straits to pelagic longline fishing in order to protect small swordfish. NMFS received comments form fishermen, scientists, environmentalists, and recreational fishermen indicating that such a small closure would not be effective given probable re-distribution of fishing effort.

Given the substantial social and economic effects of a time/area closure on fishermen and their communities and uncertainty regarding inter-annual re-distribution of fish and fishing effort, NMFS is pursuing additional analyses of larger areas. Following implementation of any time/area closure, NMFS will evaluate the reduction in discards and the significance of displaced effort, and proceed, if necessary, to implement other flexible time/area closures. The framework of this FMP allows for the development of additional time/area closures, as appropriate (see section 3.10).

Figure 3.13 Geographic areas used in summaries of pelagic logbook data from 1992 - 1997. (Cramer and Adams, 1998b)



Final Action: Establish a foundation to count dead discards of swordfish against the swordfish quota

This action and its impacts are explained in Section 3.4.1.2. Accounting for all sources of mortality is expected to create an incentive for fishermen to avoid areas where rates of interaction with small swordfish are high. While this is not a solution to bycatch as an individual measure, this measure may afford the United States a more effective negotiating strategy at ICCAT (in the future) to support bycatch reduction stock-wide. The United States has set the stage with the 1998 U.S.-sponsored resolution for rebuilding, including the counting of dead discards.

Final Action: Minimum size for swordfish (status quo, 33 pounds, 73 cm (29 inches) CK)

This action and its impacts are discussed in Section 3.4.2.2. A minimum size for swordfish may encourage fishermen to avoid areas of concentration of small swordfish because these fish cannot be sold.

Final Action: Prohibit imports of Atlantic swordfish weighing less than the U.S. minimum size

NMFS implemented a new swordfish import monitoring program which requires all swordfish importers to possess swordfish permits and report on a bi-weekly basis on their swordfish imports. This action also prohibits the import of Atlantic swordfish weighing less than 33 pounds (the current domestic minimum size). Pieces of Atlantic swordfish weighing less than 33 pounds must be accompanied by validation that they were derived from a swordfish that weighed more than our minimum size limit. This program may create an incentive for countries to avoid small swordfish since they will be refused by the United States, which is a major market for Atlantic swordfish.

Final Action: Swordfish bycatch limits in incidental fisheries (status quo)

This action and its impacts are discussed in Section 3.4.2. These retention limits may encourage fishermen who do not participate in the directed swordfish fishery to avoid areas of concentration of swordfish. These bycatch limits reduce bycatch by providing an allowance for landing of swordfish that cannot be avoided.

Final Action: Prepare a proposed rule that would implement a more effective closure area to protect small swordfish

NMFS received considerable comment regarding the proposed time/area closure to protect small swordfish in the Florida Straits. Most comments indicated that this area was too small to be effective given the likely re-distribution of effort on the "fringes" of the closed area. NMFS has therefore, chosen to reconsider a more effective time/area closure to protect small swordfish and has begun the necessary biological, social, and economic analyses necessary for proposing a larger area or areas. In response to comments, and based on earlier analyses, the larger areas include the Charleston Bump and the Florida Keys. Analyses may also continue to examine areas in the Gulf of Mexico. NMFS has scheduled a combined HMS and Billfish AP meeting for June 10 to 11, 1999 to discuss the results of new analyses that NMFS is undertaking. After that discussion, NMFS will select a preferred alternative and publish a proposed rule under the framework of this FMP.

Ecological Impacts

NMFS has conducted analyses for a private industry buyout that shows the benefits of removing effort from large, key nursery areas. While NMFS is not proposing removal of effort, these analyses clearly show that larger areas can be more effective, subject to impacts from re-distribution of effort. Closing a larger area to pelagic longline fishing may provide increased benefits to the swordfish stock if the area chosen is one of consistently high small swordfish concentrations (refer to Chapters 5 and 6 to identify essential fish habitat for juvenile swordfish). Many pelagic longline vessels are themselves "highly migratory" and may be able to redirect their fishing effort in open areas. If they redirect into areas where small swordfish are not prevalent, this alternative would still have positive ecological impacts on the stock. If these fishermen redirect to areas with similar rates of swordfish discards, this alternative would have negligible effects on stock rebuilding. NMFS cannot accurately project fishing effort re-distribution at this time, however, a large closure is likely to encourage those longline fishermen that currently fish in the "closed area" to pursue other fishing activities during the closure period.

One of the options NMFS may consider is a closure in the South Atlantic Bight during second and third quarter months. The effects on bycatch of sea turtles could be detrimental IF fishermen redirect their effort in the fourth quarter in the Northeast Coastal and Northeast Distant areas. In past years, the pelagic longline fishery has sometimes been limited due to a closure of the swordfish fishery in the fall. However, if a large closure is implemented in the summer or fall months, vessels may have an opportunity to fish throughout the fourth quarter, thereby potentially increasing their turtle catch rates. NMFS will, of course, consider the bycatch rates of turtles and marine mammals, as well as billfish and swordfish, when assessing alternatives for time/area closures. NMFS will also consider possible re-distribution of effort to accommodate for the “lost” fishing effort and the resultant “extra” quota in the Fall months relative to previous years.

Social and Economic Impacts

The cumulative economic impacts of reducing quota, counting discards against the quota, and closing a larger area to pelagic longline fishermen would be significant. NMFS will assess these impacts in more detail when it proposes the appropriate time/area closure. At this time, NMFS does not wish to implement a smaller closure area which may have significant economic impacts but minor ecological benefits. This alternative might have safety at sea implications if fishermen are encouraged to fish farther offshore than they would in the absence of such a closure. Regarding administrative costs of this alternative, NMFS is committed to using time/area closures to protect small swordfish. Therefore, the increased administrative costs that this measure entails are not considered to be excessive for the expected positive long-term benefits to the swordfish stock and the nation.

Conclusion

NMFS prefers this alternative at this time. Comments on the HMS FMP and the Amendment One to the Billfish FMP (NMFS, 1999a), and further analyses indicate that a larger area is necessary to achieve bycatch goals. NMFS has begun analyses to analyze the effectiveness of a larger closure and will present them to the public at the June 1999 Advisory Panel meeting. Effectiveness of this measure would be assessed annually by discard analyses from the remainder of the fleet. Cramer and Scott (1998) identified other areas of high discard rates of small swordfish, however, this alternative discusses only the Florida Straits area because NMFS determined at the time that closure would be most effective in achieving management objectives of minimizing bycatch and helping to rebuild overfished fisheries while also minimizing the adverse economic impacts on affected fishery participants. Closure of other times or areas could be considered under the framework provisions, pending results of the first time/area closure.

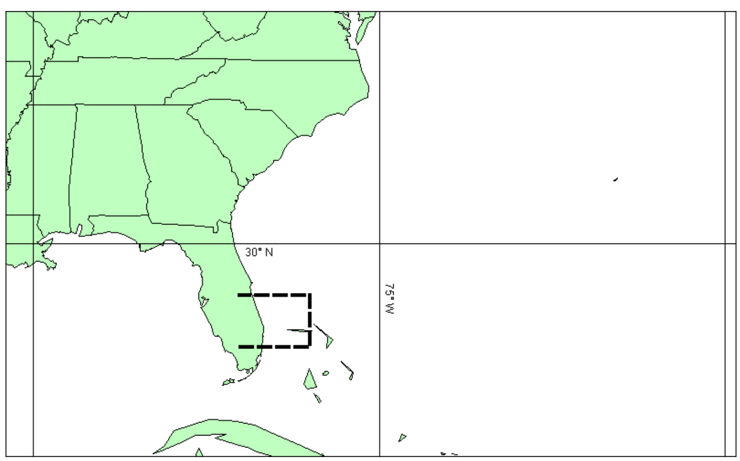
To reduce mortality on undersized swordfish, NMFS has implemented minimum size limits, retention limits for incidental fishing gears, and a time/area closure. Together, these measures are expected to encourage fishermen to avoid areas of concentrations of small swordfish, reduce the incentive for targeting swordfish by unauthorized gears, and reduce interactions between undersized swordfish and pelagic longline gear.

Rejected Options for Swordfish Bycatch Reduction

Rejected Option: Prohibit pelagic longline fishing in the Florida Straits from July through September

This rejected action would close the Florida Straits (26 to 28 latitude, 78 to 81 longitude) to pelagic longline fishing activity during the months of July, August, and September (third quarter). Refer to Figure 3.14.

Figure 3.14 Florida Straits time/area closure to reduce discards of undersized swordfish in the pelagic longline fishery.



Ecological Impacts

This action is expected to result in decreased mortality on undersized swordfish by eliminating fishing effort in a known nursery area for swordfish. The number of discards reported in vessel logbooks underestimates the actual benefits of area closures, since logbook - reported discards tend to underestimate actual discards. Further, some small swordfish that may be torn off the hook before they are boated (due to drag) are not reported in logbooks. Considering this, the positive impacts of this action are underestimated by Cramer and Scott (1998). However, there is the potential under any time/area closure program that fishing effort will shift, resulting in unpredictable but potentially negative consequences for target finfish, marine mammals, turtles, and non-target finfish. It is difficult to estimate the percentage of reductions in target catch and reductions in discards for this measure.

Although Cramer and Scott (1998) provide different scenarios for estimating fleet behavior (no redistribution of effort and re-distribution of effort), it is unknown what the fleet would do if this proposed time/area closure were implemented. If the closed area is large enough, fishermen may be discouraged from fishing "around" it. However, industry representatives have indicated to NMFS that fishermen should be expected to re-distribute fishing effort. NMFS cannot, however, estimate what increase in costs will accrue to those fishermen. Accurate prediction of fishing effort re-distribution in response to regulatory actions is difficult (Cramer and Scott, 1998). In a small area closure, effort could also shift to regions where catch rates are only marginally different, resulting in smaller than expected reductions in discards. For these reasons, NMFS proposes to close a larger geographic area under this alternative.

This action is likely to increase spawning stock biomass in the long term and increase biological productivity of the north Atlantic swordfish stock. This also appears to be an area of concentration for blue marlin and sailfish and may result in decreased discards of these species (Mace, 1997b). Based on Cramer and Adams (1998), 1997 dead discards of other species in the Florida East Coast area are summarized in the table below. Although the area described in Table 3.50 is larger than the area closed in this FMP, it gives the reader an estimate of the relative levels of discards of various target and non-target finfish. If the closure is implemented and fish distribution remains constant, it can be expected that the proposed time/area closure will also reduce pelagic longline-induced mortality of the species listed in the table.

In a recent analysis of the proposed Florida Straits time/area closure by Goodyear (1998a), that included impacts of effort redistribution, the average total blue marlin catch rises slightly, with mortality increased about one percent. The results for white marlin were similar, with catch increasing from 0.9 to 1.8 percent and mortality increasing from 1.2 to about two percent. The analysis assumes that the same amount of effort previously deployed in the closed area is deployed elsewhere during the months of the closure at the average catch per unit effort outside of the closed area. Goodyear's analyses indicated that the proposed swordfish closure would not likely reduce marlin bycatch. In fact, the results indicated that the proposed closure might slightly increase the bycatch of marlin, perhaps on the order of one to two percent. NMFS acknowledges that the mentioned closure would most likely result in a redistribution of longline effort, but there is not sufficient data to support how effort will be redistributed.

Table 3.50 Estimated dead discards of some highly migratory species in the pelagic longline fishery in 1997 in the area east of the Florida East Coast during the third quarter[4]. (Cramer and Adams, 1998a)

Species	Number Discarded Dead	Weight of Fish Discarded Dead (lb ww)
Sailfish	209	9,856
Blue marlin	26	3,498
White marlin	0	0
Pelagic sharks	0	0
Blue sharks	0	0
Thresher sharks	26	6,334
Coastal sharks	52	8,549
Dusky sharks	26	2,290
Silky sharks	131	4,919
Hammerhead sharks	183	33,213
Night sharks	183	7,115

This closure is not expected to result in increased marine mammal or turtle takes in the pelagic longline fishery. However, as discussed above, it is impossible to estimate where the fishing effort will be re-distributed. The number of turtles caught per swordfish (caught, not landed) varies by area, however, according to observer data, the South Atlantic Bight is a likely re-distribution area for fishing effort and has similar takes of sea turtles (Hoey, 1998) as the time/area closure. The Florida East Coast area ranks seventh of ten areas (Hoey, 1998), indicating that this time/area closure is not likely to significantly reduce turtle bycatch in the pelagic longline fishery. Further, even if fishing effort is re-distributed by the Florida Straits fleet, it is not likely to be re-distributed to areas of third quarter high turtle bycatch (Northeast Distant). Refer to Hoey (1998), for more information about turtle takes in the pelagic longline fishery by season and area.

Takes of sea birds are low in the Atlantic pelagic longline fishery. In seven years (July 1990 to June 1997), five birds were observed killed (in February only) in the pelagic longline fishery in the South Atlantic Bight. Takes in the Mid-Atlantic Bight were slightly higher, although this closure is not likely to affect sea bird takes.

Social and Economic Impacts

[4] This area is larger than the area analyzed for the time/area closure alternative, and therefore represents higher numbers of discards. It is inserted in this text merely to give the reader an idea of the magnitude of small swordfish discards in the general geographic area.

This action will have a significant impact on 18 of the 20 vessels that fished in this area during the third quarter of 1997. In the short term, the vessels that have fished in that area during that time of year may cease fishing for the third quarter or rely on other forms of income, including other commercial fishing operations or shoreside industries. Some fishermen should be expected to re-distribute fishing effort as a result of a time/area closure. However, a quantitative estimate of the amount and type of this redistribution cannot be made (Cramer and Scott, 1998).

This particular time/area closure is likely to reduce fishing mortality on small swordfish if swordfish abundance and catchability remain stable into the future at the five-year average levels and if effort is not re-distributed due to the large size of the closed area. While this may have a greater economic impact on smaller vessels (20 vessels ranging 32 to 58 feet in length overall), it would more effectively decrease bycatch. Therefore, population effects for swordfish are difficult to quantify, but are expected to contribute to rebuilding. Closing the larger areas for shorter periods of time (three months vs. throughout the year) will mitigate the impacts to small vessel owners who possess permits and land fish in other Southeast federal fisheries (e.g., reef fish and snapper/grouper) that they could pursue during the swordfish time/area closure. Vessel may also fish farther north along the coast (e.g., Charleston Bump area).

This closure could result in changes in fishing, processing, and marketing practices and costs if effort is re-distributed and fishermen sell their catch to previously unknown dealers. Some fishermen may continue to sell to their original buyer, however, transport costs for the catch may increase. In the long term, this measure should hasten rebuilding of this overfished stock, and fishermen will have access to more swordfish at other times of the year, thus recouping their losses during the third quarter. However, there are an increasing number of restrictive measures being placed on state and federal fisheries, including access limitation, and fishermen may not be able to rely on transferring effort to other fisheries. Dealers that buy fresh high-quality swordfish in this area are frequently located in small coastal towns in Florida such as Fort Pierce and Dania. These small businesses may specialize in swordfish or deal exclusively in swordfish and may be significantly affected during the time of the closure. Any closure that may result in fishermen fishing farther from home than they would normally, may have significant social impacts to families. It is unlikely these impacts would be transferred to a fishing community, particularly in Florida, where communities tend to harbor fishermen that participate in multiple species. The negative effects some Florida East Coast communities may feel may be minimized because the closure is for three months only. Many of these fishing vessels fish outside this area at certain times of the year anyway, possibly ranging north to the mid-Atlantic and south to the Florida Keys. Another alternative that would have a lesser impact on fishing communities would likely also have a lesser benefit to stock rebuilding, because the closure would have to be smaller in geographic area or time frame.

This action would not represent a bias toward one area or another. NMFS proposed the area with the highest reported swordfish discard rates year-round. That way, if the fish are moving into this area seasonally and they migration is offset by a few weeks, the time/area closure may still be effective. The fishing communities that may be affected by this closure may also be supported by the tourism trade. The area will remain open, however, to Charter fishing trips for highly migratory species.

This closure would increase research, administration, and enforcement costs, due largely to evaluating and monitoring the closure and implementing a VMS program for the entire pelagic longline fleet. The evaluation and monitoring program would require increased efforts to provide spatial analysis of the pelagic longline catch and discard database. Implementing a fleet-wide VMS program has substantial administration and enforcement costs up front, however once the program is established, enforcement costs would decrease, provided there are not a significant number of violations of the time/area closure.

Conclusion

Despite the possible benefits of this closure, NMFS rejects this alternative. Instead, NMFS will analyze other, more effective areas. This action is rejected because fishing distribution patterns are unknown and reductions in mortality of small swordfish may not be sufficient to justify the social and economic impacts. A time/area closure, implemented in conjunction with the current minimum size limit, may protect a vital part of the swordfish stock. The pelagic longline industry appears committed to reducing catch of undersized swordfish. However, voluntary actions by pelagic longline fishermen to date have been insufficient to slow the decline of the stock and the proposed time/area closure will help increase growth to maturity of swordfish that might otherwise be caught and discarded dead. The possible use of a buyout program for vessels that will no longer be able to fish for HMS due to the loss of revenues from implementation of this alternative is discussed in Chapter 4 (Limited Access) and Chapter 7 as a mechanism to mitigate negative economic impacts.

Although the time/area closure described above would create a significant impact on 20 vessel owners in Florida, is likely to achieve some reduction in bycatch of undersized swordfish, with possible reductions (depending on effort re-distribution) in bycatch of blue marlin, sailfish, dusky sharks and night sharks, all species of depleted populations.

Rejected Option: Status quo (No time/area closures)

NMFS rejects the status quo for implementing time/area closures to reduce bycatch of undersized swordfish in the pelagic longline fishery. Although NMFS does not currently have complete analyses to support the efficacy of an appropriate closure area or the social and economic impacts, NMFS is completing those necessary analyses and will present the options to the HMS and Billfish Advisory Panel at the June 1999 meeting.

Ecological Impacts

Current bycatch mortality rates of undersized swordfish in the pelagic longline fishery may be hindering rebuilding efforts and the minimum size results in increased discards. SCRS (1998a) indicated that if mortality on small swordfish would decrease, substantial gains in yield could accrue. Time/area closures may be an effective way to reduce fishing effort in swordfish nursery areas.

Social and Economic Impacts

Although this alternative would have the least amount of social and economic impact on the pelagic longline fishermen and their respective communities and the least administrative costs to implement, in the long term, these communities and the nation would benefit from increased yield from the stock. Therefore, NMFS rejects this option in favor of an alternative that may have greater social and economic impacts in the short term, but greater positive ecological impacts.

Conclusion

NMFS rejects the status quo in terms of implementing a time/area closure. NMFS will pursue implementation of a large area that may reduce the amount of fishing effort re-distribution and therefore be more effective in protecting the stock.

Rejected Option: Time/area closures for other fishing gears

1A: Time/Area Closures for Rod and Reel Fishermen

Ecological Impacts

NMFS does not have data at this time that indicate a need to reduce interactions between small swordfish and rod and reel fishing gear. Tagging data indicate that swordfish are encountered by rod and reel gear and that most swordfish caught on rod and reel and tagged as part of the Game Fish Tagging program are undersized fish. However, NMFS does not know the extent of swordfish catches in rod and reel gear because the tagging database is limited.

Social and Economic Impacts

In addition to a pelagic longline closure, a closure for rod and reel fishermen will affect commercial and recreational fishermen alike because pelagic longline fishermen are likely to try their luck at rod and reel fishing for swordfish if there are sufficient encounters with swordfish. If the closure will not directly benefit the stock, NMFS does not see the need for affecting commercial and recreational fishermen, tournaments, charter trips, or private fishing trips. Further, NMFS does not support restricting a gear type if unnecessary. Time/area closures for other gear types would increase administrative costs unnecessarily, especially in the enforcement arena.

Conclusion

This alternative is rejected. Bycatch of undersized swordfish by rod and reel fishing gear is currently not a concern because bycatch rates are thought to be minimal. Time/area closures will be included in the framework and can be implemented for any gear type in the future if NMFS deems bycatch is too high.

1B: Closures for Squid Trawl Fishermen

Squid trawls encounter a range of sizes of swordfish as bycatch. Most swordfish are caught in the summer months in the mid-Atlantic area. In this FMP, NMFS maintains the existing bycatch limit for squid trawls of five swordfish per trip. This limit was established in conjunction with fishery participants based on observed bycatch in the early 1990's.

Ecological Impacts

NMFS will work with the Mid-Atlantic Fishery Management Council to prevent swordfish bycatch rates from increasing in this fishery. Time/area closures in the squid fishery are not necessary at this time as NMFS considers their interaction rates with swordfish to be at a low level.

Social and Economic Impacts

Squid trawls are not able to “target” or “avoid” swordfish but because catch rates are low, NMFS allows those swordfish to be landed. Time/area closures in this fishery would have to be approved by the fishery management council and further, would unnecessarily interfere with the prosecution of that fishery (“low bang for the buck”). It is not apparent that redistributing trawl effort to another area would decrease swordfish bycatch in this fishery. Time/area closures for squid trawl vessels would increase administrative costs unnecessarily, especially in the enforcement arena.

Conclusion

This alternative is rejected. NMFS does not consider the bycatch of swordfish in the squid trawl fishery to be significant and therefore will not implement time/area closures for this fishery. Adjusting bycatch limits will be a framework measure because NMFS expects further analysis of swordfish bycatch in the squid trawl fishery as additional data are assembled.

3.4.4.1.3 Sharks

In this FMP, NMFS establishes measures that are both likely to reduce and to increase bycatch of sharks. Those measures expected to reduce bycatch are final actions to count dead discards against quotas and to establish a quota for blue sharks, against which landings and dead discards will be counted. Measures that may increase bycatch of sharks include prohibiting possession of dusky sharks, establishing a minimum size for ridgeback LCS in commercial fisheries and for all sharks in recreational fisheries, and substantially reducing the non-ridgeback LCS commercial quota. Despite the expected increase in bycatch, however, NMFS implements these measures because of the severely depleted status of these species and because NMFS’ believes that these measures are necessary to reduce overall fishing mortality. As stated in the relevant sections describing the final actions, NMFS may consider additional management measures to reduce bycatch and bycatch mortality as necessary in the future. In this section, NMFS considers time/area closures as a complement to the selected rebuilding program for LCS but does not implement any time/area closures due to NMFS’ limited jurisdiction over areas identified as juvenile and subadult shark EFH.

Final Action: **Prohibit possession of all sharks except those that are expected to be able to sustain fishing mortality; Allow retention of certain commonly landed LCS, pelagic sharks, and SCS within Federal waters**

The aspect of this action relevant to bycatch and bycatch reduction is the prohibition on possession of dusky sharks; this action and its impacts are fully discussed in Section 3.4.2.3.1. Prohibiting the possession of dusky sharks may encourage fishermen to avoid areas of high concentrations of dusky sharks. However, dusky sharks often co-occur with sandbar sharks, a primary commercial species that is authorized for retention, such that catches of dusky sharks may not decrease. Thus, prohibiting possession of dusky sharks may increase bycatch in those areas where they cannot be avoided and will likely result in increases in dead discards because the majority of dusky sharks come to the vessel dead (approximately 80 percent according to observer data). NMFS implements this action due to the severely depleted status of dusky sharks and believes that the benefits of maximizing all dusky shark survival by requiring the release of the 20 percent of dusky sharks that come to the vessel alive outweigh the drawbacks of increasing bycatch and negative social and economic impacts.

Final Action: Separate LCS management group into ridgeback and non-ridgeback LCS with each subgroup having separate quotas; Establish a minimum size and maintain quota level on ridgeback LCS; Reduce quota on non-ridgeback LCS in commercial fisheries

This action and its impacts are discussed in Section 3.4.1.3.1. Establishing a minimum size of 4.5 feet for ridgeback LCS in commercial fisheries is expected to push fishing effort offshore out of areas where undersized sharks predominate and into areas where sharks larger than the minimum size predominate, thus mitigating potential increases in bycatch. If fishing effort continues in nearshore areas, then bycatch of undersized sharks will increase. However, NMFS implements this action based in large part on the size-depth segregation that sandbar sharks, the primary ridgeback LCS, exhibit. Thus, increases in bycatch of undersized sharks are expected to be mitigated. NMFS is not implementing a minimum size for non-ridgeback LCS because these species do not segregate by size and depth such that a minimum size would increase fishing mortality as well as bycatch and bycatch mortality.

The final action to reduce the non-ridgeback LCS by 66 percent to 218 mt dw will result in substantially reduced fishery openings. In addition, this action will increase bycatch of non-ridgeback sharks in other fisheries during directed non-ridgeback fishery closures. Because the majority of non-ridgeback sharks come to the vessel dead, reduction in the non-ridgeback LCS quota will also increase bycatch mortality. NMFS implements this action due to reduce effective fishing mortality in order to rebuild these species consistent with Magnuson-Stevens Act requirements. Increases in bycatch and bycatch mortality may slow rebuilding of these species and NMFS may consider additional management measures to reduce bycatch and bycatch mortality as necessary in the future.

Final Action: Establish recreational retention limit of one shark per vessel per trip with a 4.5-foot minimum size and one Atlantic sharpnose shark per person per trip

This action and its impacts are discussed in Section 3.4.2.3.2. Establishing a minimum size of 4.5 feet for all sharks (except Atlantic sharpnose sharks) in recreational fisheries will result in most nearshore recreationally-caught sharks being released. However, post-release mortality of sharks in recreational fisheries is believed to be low.

Final Action: Account for all sources of fishing mortality in establishing quota levels, including counting dead discards and landings in state waters after Federal closures against Federal quotas

This action and its impacts are discussed in Section 3.4.1.3.5 for all species and in Section 3.4.1.3.2 for blue sharks. Counting dead discards of all sharks and establishing a quota for blue sharks, against which landings and dead discards will be counted, may encourage fishermen to avoid areas of concentration of blue sharks, prohibited species, and undersized sharks.

Final Action: No time/area closures for shark nursery and pupping areas (status quo)

Currently, there are no time or area closures (other than directed LCS closures related to quotas) that restrict commercial or recreational harvest of Atlantic sharks. This action maintains the current management structure and does not close any particular areas or times to directed or incidental shark fisheries. This action allows directed and incidental fisheries to continue to retain Atlantic sharks within the bounds of implemented regulations (species management groups, commercial quotas and retention limits, recreational retention limits, prohibited species, fishing seasons).

Although several coastal bays and estuaries have been identified as important pupping and nursery areas for sandbar and dusky sharks (notably Delaware, Chesapeake, and Bull's Bays), these areas are within state waters and outside of NMFS' jurisdiction. However, NMFS is continuing to work with Atlantic and Gulf of Mexico states and Regional Fishery Management Councils and Commissions in developing consistent state and Federal shark regulations.

One area that is within NMFS' jurisdiction is what is considered to be an important overwintering area for juvenile and subadult sandbar and dusky sharks off Cape Hatteras and management options for that area are discussed below.

Note that additional analyses and alternatives on possible time and areas closures that may impact shark fisheries are discussed above under Atlantic swordfish rebuilding and reducing bycatch of undersized swordfish alternatives.

Ecological Impacts

The selected minimum size for all sharks for the recreational fisheries (except Atlantic sharpnose sharks) and for ridgeback LCS for commercial fisheries is expected to provide protection for the most sensitive stages/sizes of sharks within Federal waters, regardless of time or area. A minimum size for sharks may be considered a sort of "moving" time/area closure as fishermen go farther offshore to target and catch larger sharks. A more complete discussion of these actions and its effect on juvenile sharks can be found under Sections 3.4.1.3.1 and 3.4.2.3.2.

Social and Economic Impacts

This action is not expected to have any short term social or economic impacts because fishermen are already operating under this restriction. Potential long-term impacts may result if the stocks cannot rebuild and additional harvest restrictions are necessary.

Conclusion

This action is selected because other measures implemented in this FMP, including separating LCS into ridgeback and non-ridgeback LCS, establishing a minimum size and separate quota for ridgeback LCS, establishing and substantially reducing the non-ridgeback LCS quota, counting dead discards and state landings after Federal closures against Federal quotas, and prohibiting possession of dusky sharks are expected to rebuild overfished LCS consistent with the Magnuson-Stevens Act and the National Standards. Additionally, given the limited degree of nursery and pupping areas in Federal waters, this action is not likely to result in the level of fishing mortality reduction necessary to rebuild LCS. Further, as many Atlantic and Gulf of Mexico states have recently implemented or are considering implementing more restrictive shark harvest regulations, including fishery closures, the need for Federal time and/or area closures is reduced.

Rejected Options to Minimize Bycatch of Sharks

Rejected Options: Close juvenile and subadult Essential Fish Habitat (EFH) year-round to directed shark fishing and retention of all shark bycatch

Ecological Impacts

This alternative would prohibit directed fishing for, and possession of, sharks in areas identified as juvenile and subadult EFH (see Chapter 6) at all times. It would provide maximum protection to juvenile and subadult sharks as well as pregnant females in those areas identified as EFH, thereby enhancing rebuilding. However, because EFH has not been identified as all areas in which these stages/sizes are found, this alternative would allow for fishing mortality on these stages/sizes outside of designated areas. This alternative would result regulatory discarding of all sharks caught in closed areas.

Social and Economic Impacts

This alternative would likely have substantial social impacts on nearshore fishermen who cannot expand their fishing effort offshore. This alternative may result in changes in fishing practices in fisheries other than shark fisheries order to reduce shark bycatch. In the long term, this alternative would likely result in faster rebuilding of LCS, and thereby in a quicker return to an economically-viable shark fishery.

This alternative could have significant economic impacts. Juvenile EFH primarily occurs in state waters; however, some areas are located in Federal waters. This alternative may force fishermen and processors in or near the closed areas out of business by forcing them to increase costs and fish offshore or in unfavorable waters.

Conclusion

Most of the areas identified as EFH for juvenile and subadult sharks are in nearshore waters and coastal bays and estuaries, and accordingly, are outside of NMFS' jurisdiction. However, NMFS intends to continue working with Atlantic and Gulf of Mexico states, the Regional Fishery Management Councils, and the Atlantic States Marine Fisheries Commission to implement sharks harvest regulations that will meet conservation objectives. Therefore, this alternative is rejected. However, as many Atlantic and Gulf of Mexico states have recently implemented or are considering implementing more restrictive shark harvest regulations, including fishery closures, the need for Federal time and/or area closures is reduced.

Rejected Option: Close juvenile and subadult EFH during spring pupping season to directed shark fishing and retention of all shark bycatch

Ecological Impacts

This alternative would prohibit directed fishing for, and possession of, sharks in areas identified as juvenile and subadult EFH (see Chapter 6) during the spring pupping season (primarily June through September). It would provide less protection for juvenile and subadult sharks as well as pregnant females than a year-round closure in those areas identified as EFH but would still enhance rebuilding. Because EFH is not identified in all areas where these stages/sizes are found, this alternative would allow for fishing mortality to continue on these stages/sizes outside of designated areas. This alternative would result in fewer sharks becoming regulatory discards than under a year-round closure because the closures would be less extensive.

Social and Economic Impacts

This alternative would have similar, but less severe, social and economic impacts as those discussed for a year-round closure above. It would likely have fewer social impacts on nearshore fishermen because the closure would only affect spring fishing operations. For those nearshore fishermen who cannot expand their fishing effort offshore or delay until later in the year, this alternative may have substantial impacts. This alternative may result in changes in fishing practices in other directed fisheries to reduce shark bycatch. In the long term, this alternative would likely result in faster rebuilding of LCS, and thereby in a quicker return to an economically-viable shark fishery.

Conclusion

Most of the areas identified as EFH for juvenile and subadult sharks are in nearshore waters and coastal bays and estuaries, and accordingly, are outside of NMFS' jurisdiction. Therefore, this alternative is rejected. However, as many Atlantic and Gulf of Mexico states have recently implemented or are considering implementing more restrictive shark harvest regulations, including fishery closures, the need for Federal time and/or area closures is reduced.

Rejected Option: Close sandbar and dusky shark juvenile and subadult wintering EFH off Cape Hatteras, NC, to directed shark fishing and retention of all shark bycatch

Ecological Impacts

This alternative would prohibit directed fishing for, and possession of, sharks in the area off Cape Hatteras, NC, for the traditional winter fishing season in order to provide maximum protection for juvenile and subadult sandbar and dusky sharks that overwinter in that area. These areas have been identified as sandbar and dusky shark juvenile and subadult wintering EFH off Cape Hatteras, NC (see Chapter 6). This alternative would complement the selected ridgeback LCS minimum size by providing protection for those stages/sizes in areas of high concentration that are more vulnerable to fishing. This alternative would enhance rebuilding of the ridgeback LCS and reduce bycatch of sharks under the minimum size.

On July 25, 1997, the State of North Carolina issued a proclamation that prohibited commercial retention of all sharks except Atlantic sharpnose shark and species in the pelagic species group. This proclamation is intended to reduce the mortalities of immature sandbar and dusky sharks, based on observer data indicating that about 90 percent of sharks taken in North Carolina state waters (inside of ten fathoms) are immature. The State of North Carolina believes that this proclamation effectively eliminates the juvenile sandbar and dusky shark winter fishery, and negates the need for the time/area closure (J. Francesconi, NC Division of Marine Fisheries, Morehead City, NC, personal communication).

Social and Economic Impacts

This alternative would likely cause substantial adverse social impacts because the traditional winter season comprises substantial fishing opportunities for the directed shark fishery in that area. Generally, winter is a time of fewer alternative employment opportunities in coastal communities and the loss of revenue from directed shark fishing in the winter season may be acutely felt by fishermen and communities in that area. Additionally, this alternative would also likely impact fishermen in other fisheries, which may depend on the ability to land their incidental catches of sharks for a source of revenue. This alternative would address safety at sea concerns that would result from the proposed minimum size (which would push fishing effort offshore in winter months) for ridgeback LCS.

This alternative may have a significant economic impact on fishermen and processors who rely on fishing off North Carolina. Many of them may be forced out of business for similar reasons as noted above. This alternative would have little economic impacts on fishermen and processors outside of North Carolina.

Conclusion

This alternative is rejected because the North Carolina proclamation prohibiting commercial retention of all sharks is expected to eliminate the juvenile sandbar and dusky shark winter fishery, thereby addressing effectively the need to protect those sensitive sizes/stages. Additionally, several other measures selected in this FMP, including separating LCS into ridgeback and non-ridgeback LCS, establishing a minimum size and separate quota for ridgeback LCS, establishing and substantially reducing the non-ridgeback LCS quota, counting dead discards and state landings after Federal closures against Federal quotas, and prohibiting possession of dusky sharks, are expected to rebuild overfished LCS consistent with the Magnuson-Stevens Act and the National Standards.

3.5.4.1.4 Billfish

Final Action: Status quo

NMFS received considerable comment from billfish fishermen regarding the proposed measures to reduce bycatch; particularly the time/area closure to protect small swordfish in the Florida Straits. Most comments indicated that this area was too small to be effective given the likely re-distribution of effort on the "fringes" of the closed area. There was also serious concern about the impacts on billfish of such a closure given expected re-distribution of fishing effort. NMFS has, therefore, chosen to reconsider the proposed time/area closure to protect small swordfish and has begun the necessary ecological, social, and economic analyses necessary for proposing a larger area or areas. NMFS will consider the effects of a larger closure on billfish mortality in all new analyses. Several measures were proposed in the draft HMS FMP that are contained herein that will also reduce billfish bycatch mortality and may decrease billfish bycatch in the pelagic longline fishery. However, NMFS expects that the single measure that is likely to reduce billfish bycatch may be a larger time/area closure. NMFS has scheduled a combined HMS and Billfish AP meeting to discuss the new analyses for a more effective closure to protect small swordfish.

NMFS also received considerable comment about selecting time/area closures to specifically reduce billfish bycatch. NMFS has conducted its own analyses (Mace, 1997) and has studied analyses submitted by external scientists (Goodyear, 1998b) which do NOT indicate that there are "hot spots" that could be closed to pelagic longline fishing to protect billfish without significant decreases in landings of target species. If an area larger than that which was proposed is closed, fishermen may select not to longline during the closed time at all, and therefore impacts from re-distribution of effort are likely to be lower than under a small closure plan.

NMFS will continue to search for ways to minimize billfish bycatch but NMFS also anticipates results from a gear modification study that is ongoing that may indicate that bycatch mortality can be minimized through gear modifications such as the use of circle hooks.

3.5.4.1.5 General Bycatch Reduction Measures

NMFS considered alternatives to address discards of all HMS for all gear types. The FMP includes a limited access program for swordfish, shark, and pelagic longline fisheries for tunas other than bluefin, which should contribute to the U.S. effort to decrease discards. Other general measures that are designed to reduce bycatch and bycatch mortality of all non-target finfish include gear modifications and VMS. Taken together with final actions on permitting and reporting requirements, the measures in this section are intended to help NMFS meet the requirements of NS9. These actions provide for collection of information from sectors of HMS fisheries for which there is currently limited information available. Information collected under these management measures will be used, in part, to help NMFS identify and prioritize bycatch management needs in HMS fisheries (refer to Section 3.8).

Final Action: Require the use of a vessel monitoring system (VMS) on all pelagic longline fishing vessels

Refer to Section 3.8.2 for a complete description of this measure which is designed to enforce any time/area closure.

Final Action: Require that longline gear, harpoon floats, hand line floats, purse seine floats, and drift gillnet floats be marked with the vessel ID number or vessel name

One of the difficulties in enforcing time/area closures for reducing bycatch is identification of fishing gear. Another problem arises when marine mammals are entangled in fishing gear. This measure requires that longline gear be marked with the vessel ID number on the terminal ends of the gear as well as on hi-flyers. It also requires that purse seine, harpoon, handline, and drift gillnet vessels mark all floats with the vessel ID number. This is important for enforcement of the time/area closures (pelagic longline), transfer at sea provisions (harpoon and handline floats), and to identify any lost gear, ghost gear, or gear causing entanglements with other fishing gears or protected species. This action will also help to identify fishing gear for gear compensation cases. The Atlantic Large Whale Take Reduction Plan regulations (62 FR 39157, July 22, 1997) currently require certain fishing gears to be marked in the event a whale is entangled in the gear. This strategy is useful in tracking the location of the entanglement (assuming the fishermen knows where his gear is located). Public comments indicated that many longline vessel owners currently mark all floats of the longline with the vessel name and that a vessel ID number would be redundant. NMFS agrees and will allow marking of gear with a vessel name.

Ecological Impacts

Under some circumstances, it is difficult for enforcement agents to determine ownership of a section of commercial fishing gear when it is in the water. Gear in the U.S. pelagic longline fishery is deployed for 15 to 40 miles, and may not have a readily identifiable link to a particular vessel. Gear marking would greatly increase the enforceability and effectiveness of a time/area closure by allowing enforcement agents to determine ownership of gear found fishing in closed areas. Fishermen often report lost gear in the Atlantic Ocean, and this is a concern for lost nets because they may continue to interact with, and possibly harm, marine resources. The tuna and swordfish regulations currently prohibit transfer at sea and if harpoon and handline floats are marked, enforcement personnel can determine which bluefin tuna belong to each vessel, or whether swordfish are being transferred for whatever reason. This action has the important ecological benefit of helping to reduce fishing mortality on the species and life stages that the closed area is intended to protect.

Social and Economic Impacts

Social and economic impacts of this measure are expected to be minimal due to the fact that vessels would merely need to mark the terminal ends of the gear and any high-flyer along the length of the mainline (longline), and floats of driftnets, harpoons, handlines, and purse seines. Costs would be primarily a one-time expenditure, except to maintain clarity of the markings. Costs are not expected to affect vessel productivity. A proposed rule to consolidate HMS regulations was published in the *Federal Register* (61 FR 57361; November 6, 1996) and included a proposal to require marking of longline and harpoon gear in HMS fisheries. Five public hearings were held to receive comments on that proposed rule; no comments were received on the gear marking issue. The advisory panel discussed allowing vessel name to mark the gear instead of vessel ID number and NMFS changed the preferred alternative to include the vessel name. This is currently a common practice in this fishery.

Conclusion

This is a final action. Gear modifications are an effective way to decrease unwanted bycatch in HMS fisheries, reduce bycatch mortality, aid in rebuilding, and increase enforcement of other HMS conservation and management measures. In addition, gear modifications may be an effective way to meet requirements to enforce measures to protect marine mammals, sea birds, and sea turtles with minimal impact on fishermen and administrative costs.

Final Action: Mandatory observer coverage in the Atlantic tunas fisheries and commercial shark and swordfish fisheries, if selected

Refer to Section 3.8.2 for a complete description of this measure which is designed to incorporate an existing regulation which was implemented under the authority of ATCA to collect catch, bycatch, and effort information from these fisheries.

Final Action: Voluntary observer coverage of HMS charter/headboat vessels

Refer to Section 3.8.2 for a complete description of this measure which is designed to collect bycatch information from these fisheries.

Final Action: Provide voluntary education workshops for all HMS fishermen

NMFS will offer voluntary workshops for recreational and commercial HMS fishermen in order to increase knowledge of measures that minimize bycatch and bycatch mortality.

Ecological Impacts

This action is expected to: 1) reduce bycatch mortality by demonstrating to operators handling and release techniques for finfish, turtles, and marine mammals; and 2) improve the accuracy of recreational bycatch reporting to dockside and telephone surveyors. This measure is likely to benefit overfished stocks of HMS by increasing post-release survival of fish captured and discarded. Current levels of bycatch and bycatch mortality in some HMS fisheries are not known.

Social and Economic Impacts

NMFS will conduct educational workshops. Therefore, the only cost incurred by the fishermen will be that related to travel and time to attend the workshops. To minimize this cost to fishermen, workshops would be offered at several locations near recreational and commercial HMS fishing ports. Workshops may also be held during the non-fishing season (in appropriate fisheries) to minimize lost fishing time. NMFS will rotate the locations of workshops in an attempt to attract fishermen to these workshops. The administrative costs for these workshops are high, but are exceeded by the benefits associated with the possible decrease in bycatch and bycatch mortality that might result from education.

Possible Topics for Voluntary HMS Fishery Workshops include:

- Educate participants about the Magnuson-Stevens Act, MMPA, and the ESA and bycatch minimization requirements;

- Promote open communication at sea between vessel operators concerning interactions with bycatch species (e.g., protected species, undersized finfish);
- Encourage feedback from those who have experienced interactions first hand;
- Provide information on safe handling techniques for released fish and protected species;
- Provide marine mammal, sea turtle, and finfish identification keys;
- Promote the use of gear modifications that reduce bycatch and bycatch mortality;
- Obtain input from fishermen regarding possible mandatory reporting of economic cost information;
- Discuss and evaluate the effectiveness of de-hooking and cutting devices to release finfish, turtles and other bycatch species;
- Develop a dialogue with fishery participants about current regulations, research priorities, and safety issues.

Conclusion

NMFS rejected the original alternative that would require all recreational and commercial HMS vessel operators to attend an educational workshop once every two years and to possess a certificate from that workshop on board at all times. Because there is not currently a permitting system for all recreational HMS vessels, the universe of affected vessels is unknown. As a result, there would no reliable way to either communicate the requirement to the affected universe or enforce participation in mandatory workshops.

However, since there may be positive ecological benefits for overfished HMS, NMFS will conduct workshops on a voluntary basis for all HMS fishermen, possibly in conjunction with public hearings, to achieve further reductions in bycatch in HMS fisheries. This measure is consistent with the Magnuson-Stevens Act.

Rejected Options for General Bycatch Reduction Measures

Rejected Option: Status Quo (No Gear Modifications)

Ecological Impacts

There are currently no gear restrictions other than types of fishing gear that are authorized in HMS fisheries. Many gear modifications to reduce bycatch are already employed by HMS fishery participants; other gear modifications are being investigated through NMFS-sponsored research programs.

Social and Economic Impacts

There would be no short-term impacts of this alternative. Long-term impacts of the status quo could include decreased revenues due to continued overfishing and increased costs to society based on the existence value of protected species. Although this alternative has the lowest administrative costs in the short term, the long-term results of not controlling bycatch and bycatch mortality may increase administrative costs in the future.

Conclusion

This alternative is rejected in favor of the final action that requires gear marking. Furthermore, NMFS plans to pursue gear modifications to reduce bycatch through a suite of non-regulatory measures, as recommended by the HMS AP.

Rejected Option: Prohibit the possession and use of any hook but a circle hook in HMS recreational fisheries.

Ecological Impacts

This alternative is designed to reduce bycatch mortality in recreational catch-and-release fisheries. Post-release survivability is an important component in a rebuilding program as recreational retention limits are, or may be, reduced to aid rebuilding. Currently, fish that are hooked and released not regularly reported to NMFS, however, they are considered bycatch under the definition in the Magnuson-Stevens Act. Fish that are hooked but are not brought to the boat because they break off are not reported to NMFS, however, they also are considered bycatch. The one exception is for billfish. For more details, refer to Amendment One to the Atlantic Billfish FMP (NMFS, 1999a).

There is evidence from ongoing studies that circle hooks may increase post-release survival by minimizing hook damage to the fish, particularly in “chunking” situations. Circle hooks are more likely than conventional “J” style hooks to hook a fish in the jaw rather than the throat, stomach, or palate. Preliminary results of a study on a limited number of school size bluefin tuna found that 100 percent of the samples were hooked in the jaw with circle hooks while 43 percent were hooked in the jaw with standard straight hooks (G. Skomal, MA Division of Marine Fisheries, Vineyard Haven, MA, pers. comm., 1998). Lines using circle hooks also seemed less prone to ‘break-aways’ before the fish was brought to the boat. Data from a study similar to that described above indicate that circle hooks resulted in 100 percent jaw hookings for Atlantic bonito, spiny dogfish, and bluefin tuna, while straight hooks resulted in throat, palate, and “deep” hooking sites (G. Skomal, pers. comm., 1998). While this information is preliminary, it is supported by anecdotal information from billfish and tuna fishermen that indicates that when circle hooks are used, post-release survival is likely to be higher than when straight hooks are used, and by research conducted in other fisheries. Fly-fishing gear may extend the fight time and increase post-release mortality rates of billfish.

Social and Economic Impacts

The cost of circle hooks is comparable to the cost for other types of commonly used hooks in the HMS recreational fishery. However, fishery participants may not support this alternative because it would require discarding all other types of hooks, including fly-fishing gear which has become increasingly popular. Nevertheless, this alternative represents a capital expenditure that is minor considering other expenditures in this fishery. Impacts of this measure are difficult to assess. For example, if a vessel is going fishing for king mackerel and tunas in the same trip, only circle hooks would be allowed on board. This impact on a charterboat or private recreational fishermen may be large or small depending on the number of "split" trips are made.

Because hook manufacturing and marketing strategies are in place for the current hook design, hook manufacturers might not be able to produce or market circle hooks effectively enough to recoup any losses prompted by this alternative. However, tackle shops and hook manufacturers are exploring the possibility of mass producing circle hooks that would have properties acceptable to HMS recreational fishery participants. This alternative would have high administrative costs due to enforcement efforts that would be necessary as well as management efforts to define the circle hook.

Conclusion

The HMS and Billfish APs discussed this alternative at a meeting in July 1998. While no clear consensus was reached, the APs expressed general support for the use of circle hooks to reduce post-release mortality, with the reservation that this alternative would be better implemented in a non-regulatory way, such as through educational programs and outreach to the recreational fishing community. Representatives of the recreational fishing community have expressed their support for the use of circle hooks, though they question the necessity of creating a mandatory requirement when educational programs could serve the same objective. NMFS agrees. It is difficult to assess the ecological and social and economic impacts from this alternative due to the continued need for hooking/survival studies on HMS and the multi-species nature of some of the HMS fleet. Therefore, NMFS has decided that the use of circle hooks, particularly in "chunking" situations, should remain voluntary until more information is available on the effects and impacts of this measure.

Rejected Option: Prohibit the possession and use of any hook but a circle hook in HMS commercial fisheries.

Ecological Impacts

There is a similar lack of knowledge about the effects of circle hooks in HMS commercial fisheries as recreational fisheries. It is unknown what effect the use of circle hooks would have on target and non-target finfish because mortality is related to soak time as well as hook type. For swordfish, for example, the use of circle hooks is not likely to reduce mortality significantly because this species dies early on in a pelagic longline soak (Berkeley and Edwards, 1997). For species such as marlins that live longer on a pelagic longline, hook type may play a more prominent role in survival.

Social and Economic Impacts

This alternative would require the use of circle hooks in all longline fisheries for HMS. This may have a significant impact on longline fishermen due to the cost of hooks and changes in the species composition of the catch. These impacts are difficult to assess because of the changing hook composition of pelagic longlines in the fishery. Vessels in the Gulf of Mexico, at one time, used predominantly circle hooks to target tunas, however, catches of swordfish have increased in that fishing sector and hook types may have been changed. If circle hooks provide for increased survival on a hook, there is an advantage to using hooks to benefit fishermen as well. Tunas harvested live are fresher and therefore of a better quality and should command a higher price. This alternative would have high administrative costs due to enforcement efforts that would be necessary as well as management efforts to define the circle hook.

Conclusion

This alternative is rejected. This FMP will establish voluntary educational workshops that can be used as a mechanism to spread information among the fleet about techniques that may reduce bycatch or bycatch mortality and have a minimal economic impact.

Rejected Option: Require all vessels fishing for or possessing HMS to have a hook removal device on board.

Ecological Impacts

This alternative may result in increased post-release survival of HMS released from pelagic longline or rod and reel gear. However, impacts are not quantified at this time.

Social and Economic Impacts

Hook removal devices are commercially available from several vendors and are used to minimize injury to the fish during removal of the hook. The HMS AP discussed the use of hook removal devices at its March 1998 meeting. Members of the AP representing all sectors of HMS fisheries were extremely supportive of the voluntary use of these devices. Fishery participants have largely supported the use of hook removal devices in some applications in HMS fisheries, though education about voluntary use is thought to be a more effective tool than regulation for this measure. Enforcement of this alternative would be extremely challenging. Although dockside inspections would identify the presence or absence of the tool, but would not address whether or not the devices were actually used. Dehooking devices cost about $45 to 90 per tool and NMFS understands that use of the devices is already widespread in HMS fisheries. This alternative would have high administrative costs due to the enforcement efforts that would be necessary.

Conclusion

As with circle hooks, the best approach to hook removal is to continue to build on the progress that recreational and commercial fishermen are making voluntarily.

Rejected Option: Prohibit the use of pelagic longline gear in HMS fisheries

NMFS has received written and verbal public comment at several public meetings as well as from some HMS AP members, expressing concern about bycatch rates in the pelagic longline fishery. Many of those commenting advocated prohibition of pelagic longline gear in HMS fisheries as an enhancement to rebuilding overfished stocks and reducing bycatch mortality.

Ecological Impacts

Prohibiting the use of pelagic longlines is likely to have positive benefits on highly migratory species. However, the benefits would be quickly lost if ICCAT were to reallocate the U.S. portion to other countries for harvest. In addition, the United States remains a strong market for swordfish. Imports are likely to increase with the demise of the domestic fishery thus supporting the fisheries of countries, as mentioned above, that do not implement restrictive conservation measures.

Social and Economic Impacts

This measure would have a significant impact on communities and on individuals and small business. It is inconsistent with the Magnuson-Stevens Act due to National Standard 9 which indicates that bycatch is to be minimized, “to the extent practicable.” NMFS does not agree with some commenters that eliminating the entire pelagic longline fleet is practicable because there would be excessive economic impacts, and the effect of shifting quota to other countries. The administrative costs of implementing this measure and then continuing to manage the fishery would decrease substantially. This decrease in costs is not considered necessary at this time.

Conclusion

This alternative is rejected for several reasons. The pelagic longline fishery is allocated 98 percent of the north Atlantic and 100 percent of the south Atlantic U.S. swordfish quota. Under ATCA, the United States cannot implement measures which have the effect of raising or lowering quotas, although NMFS has the ability to change the allocation of that quota among different gear groups. The swordfish fishery is confined, by regulation, to three gear types: harpoon, longline, hand gear. Since it is unlikely that the hand gear sector would be able to catch the quota given the size distribution of the stock, prohibiting longline gear would essentially have the effect of hindering the ability of U.S. fishermen to harvest the full quota. It would also have the effect of reducing traditional participation in the swordfish fishery by U.S. vessels relative to their foreign competitors because the United States would harvest a vastly reduced proportion of the overall quota. Such action is prohibited by section 304(e) of the Magnuson-Stevens Act. Finally, it is likely that ICCAT would allocate the U.S. north Atlantic swordfish quota share away from the United States in response to implementation of this alternative, essentially resulting in no positive effects on swordfish stocks; indeed, there may be more detrimental effects if quota is harvested by other countries with fewer or no restrictions on pelagic longline fishermen. This measure would also have a severe adverse impacts on the pelagic longline fishermen, related industries, and the communities of which they are a part. Most comments that NMFS received on the draft FMP indicated support for banning longline fishing in order to reduce bycatch. NMFS is addressing bycatch in this fishery in this FMP and may further establish time/area closures and gear modifications under the framework to address bycatch concerns to the extent practicable.

3.5.4.2 Reducing Protected Species Bycatch and Bycatch Mortality

Final Action: Require all vessels fishing for HMS to move one nautical mile after an entanglement with protected species

Ecological Impacts

Data show that marine mammals are often encountered in clusters (AOCTRT, 1996). The Atlantic Offshore Cetacean Take Reduction Team recommended that longline fishermen be required to move after one entanglement and alert other vessels in the immediate area. Industry representatives to the AOCTRT estimated that this strategy would result in a 40 percent reduction in serious injury and incidental mortality of strategic stocks of marine mammals. They also asserted that communication among members of the fleet fishing near each other is very important to reducing takes of marine mammals. Hoey (1998) indicates that sea turtles are encountered in clusters when interacting with pelagic longline gear. This action may reduce takes of sea turtles as well as marine mammals in pelagic longline gear by prompting vessels to move from the area of protected species interactions. VMS may afford increased enforcement capability for this measure. Since this practice is already used, this alternative may not have a significant impact on marine mammal bycatch.

Social and Economic Impacts

This alternative may reduce landings of target finfish, especially in areas where HMS and marine mammals have substantial geographic overlap. However, commercial longline fishermen report that they already often move out of marine mammal areas to avoid injuring the mammals or to avoid predation by pilot whales on hooked tunas. Since this practice is already used, this alternative may not have a significant impact on vessel operation.

Under this alternative, fuel costs may increase, depending on the size of the area in which marine mammals or turtles are encountered and the amount of time it takes to find an area that is free of protected species. Safety of human life at sea should be considered when evaluating this alternative. These impacts are not expected to be substantial. This alternative will have moderate administrative costs as NMFS and observers work together to evaluate the efficacy of this measure. In addition, this measure may be difficult to enforce.

Conclusion

This measure is a result of team consensus. It is likely that most pelagic longline fishermen already comply with this measure.

Final Interim Action: Limit the length of the mainline of a pelagic longline to 24 nautical miles from August 1 to November 30 in the Mid-Atlantic Bight

This measure imposes a cap on the length of mainlines in the pelagic longline fishery in the Mid-Atlantic Bight (MAB, refer to Figure 3.13) area between August 1 and November 30. This is an interim measure that will expire one year after the date of effectiveness. At that time, NMFS will evaluate the effectiveness of this measure with respect to reducing bycatch of marine mammals in this area and will determine whether or not to continue to limit the length of the mainline. The main reason for implementing this measure is to reduce takes of marine mammals although there may be other ecological benefits. Limiting the length of the mainline has the advantage of reducing the soak time and thus allowing fish to be retrieved sooner than they would be if the line were many miles longer, increasing post-release survival of discarded fish. Also, hooked fish are vulnerable to predation. In the case of the pelagic longline fishery, pilot whales are attracted to tunas hooked on longlines. This alternative could allow fishermen to haul the line and retrieve the tuna before the tunas are scavenged by pilot whales who could, in turn, become hooked on or caught in the line.

Mainlines in the pelagic longline fishery can range between approximately 15 and 40 miles. Observer data indicate that in 1996 and 1997, the average length of mainline fished by pelagic longline fishermen was 20.3 miles and 21.7 miles, respectively. The take reduction team met in 1996 however, and developed this measure based on anecdotal information that the average length of the mainline was 30 to 35 miles in this area at that time (AOCTRT, 1996). Based on 1996 and 1997 practices, longline fishermen, on average, will not have to shorten the length of their lines when fishing in the MAB. Bycatch of both marine mammals and finfish is likely to be reduced in the sets of 38 vessels that have fished longer lines in the past. Forty-one vessels made 74 trips in the MAB August 1 to November 30, 1997.

Ecological Impacts

By reducing fishing effort per set, this action has the potential to reduce takes of marine mammals by reducing the number of hooks per set. However, some fishermen have indicated that they may re-rig their gear to maintain the same number of hooks per set. The pelagic longline industry representative to the Atlantic Offshore Cetacean Take Reduction Team estimated that restricting the length of longline gear would result in a 20- to 30-percent reduction in serious injury and incidental mortality of strategic stocks of marine mammals in this area during this time (based on 20- to 30-percent line length reduction). This measure is also likely to reduce catches of finfish species, some of which are overfished (LCS, swordfish, blue and white marlins, bluefin tuna). This analysis, however, may be overly optimistic if fishermen react by making more sets, or if longlines are already shorter than this length. A shorter line implies fewer hooks, a shorter soak time and haul time, thus reducing the overall time the gear is in the water.

This shorter soak time may increase survival of some finfish species, particularly billfish (Berkeley and Edwards, 1997).

Social and Economic Impacts

This action may decrease the efficiency of fishing operations. Increased costs may not be passed on to consumers in an effort by domestic fishermen to remain competitive with imported swordfish. This alternative would result in an average reduction in mainline of three miles (range: one- to eight-mile reduction necessary) to 41 vessels that fished in this area in 1997 using a mainline longer than 24 miles. This reduction would proportionally reduce revenues by 11 percent to those 41 vessels (assuming catch decrease proportional to line length reduction). This assumption , however, may be overly conservative if fishermen react by making more sets. This alternative exceeds RFA guidelines for a significant impact on a substantial number of small businesses. For August to November, gross revenues would be reduced by greater than five percent for greater than 20 percent of the vessels fishing in that area at that time. This alternative will have moderate administrative costs as NMFS and observers work together to evaluate the efficacy of this measure. In addition, this measure may be difficult to enforce.

Conclusion

This measure is a result of team consensus. It is likely that most pelagic longline fishermen in this area already comply with this measure. NMFS implements this measure on an interim basis and will evaluate the efficacy (i.e., whether fishermen are making more sets) in the future. NMFS expects that the take reduction team will meet in the future to address the many changes to the fishery since the plan was submitted to NMFS in 1996.

Final Action: Voluntary vessel operator education workshops for HMS pelagic longline vessels

Consistent with the take reduction team's recommendation, HMS will offer voluntary pelagic longline education workshops in an effort to disseminate information about bycatch and bycatch mortality reduction. Permit holders will be notified annually of workshops held in their area. It is expected that once limited access is implemented in this fishery, fishermen will have a vested interest in this fishery and are more likely to implement voluntary bycatch reduction measures. For more information, see the workshop final action above.

Final Action: Adopt the Atlantic Large Whale Take Reduction Plan regulations under the authority of the Magnuson-Stevens Act

NMFS will establish consistent regulations for the southeast shark drift gillnet fishery under the authority of the Magnuson-Stevens Act as well as under the Marine Mammal Protection Act (incorporation by reference). These regulations include gear marking requirements, observer coverage requirements, closed areas and times, and special provisions for strikenetting (see final rule and Atlantic Large Whale Take Reduction Plan, February 16, 1999, 64 FR 7529).

NOTE: There are inconsistencies between the final rule governing the List of Fisheries and Gear under the Magnuson-Stevens Act (64 FR 4030), the Large Whale Take Reduction Plan regulations under the Marine Mammal Protection Act (64 FR 7529), and the proposed rule to implement the HMS FMP (64 FR 3154) regarding the use of strike nets in the shark drift gillnet fishery. NMFS will address these inconsistencies through future regulatory and other actions.

Ecological

This action maintains current levels of protection for marine mammals under the Marine Mammal Protection Act. It will likely have similar ecological impacts as those discussed under the status quo because fishermen are already operating under these restrictions. This action does not support states' efforts to reduce shark drift gillnet bycatch and bycatch mortalities of juvenile sharks, sea turtles, and other valuable finfish.

Social and Economic Impacts

This alternative would not be expected to have additional social or economic impacts because fishermen are already operating under these restrictions. It would maintain enforcement costs and administrative burdens of observer coverage and fishery monitoring.

Conclusion

This action is selected due to the benefits of ensuring regulatory consistency under both the Marine Mammal Protection Act and Magnuson-Stevens Act.

Final Action. Require 100 percent observer coverage in the shark drift gillnet fishery at all times; Prohibit the use of drift gillnet gear in Atlantic shark fisheries unless a NMFS-approved observer is on board

The southeast shark drift gillnet fishery, a Category II fishery that is believed to be responsible for bycatch of at least one right whale, has been suspected of interactions with endangered sea turtles as well as valuable finfish along the Georgia coast for a number of years. Specifically, strandings of loggerhead sea turtles, tarpon, adult red drum, and possibly cobia have coincided with observations of shark drift gillnet vessels operating in Federal waters off the Georgia coast. Since 1992, the State of Georgia has requested that NMFS require 100 percent observer coverage in this fishery in order to document any bycatch. In 1993, the State of Georgia requested that NMFS prohibit the use of this gear in this fishery to reduce bycatch of sea turtles, important recreational finfish species, as well as to reduce the catches of juvenile sharks and potentially Atlantic sturgeon. In 1996, the Southeast Regional Office recommended public consideration of elimination of this component of the fishery for Atlantic sharks due to "large, but unavoidable incidental catch of many different species," including sea turtles, king and Spanish mackerel, and cobia.

In part due to requests from the State of Georgia, NMFS placed observers on board shark drift gillnet vessels in 1993. During the period 1993 to 1995, 48 trips and 52 net sets were observed in which no marine mammals and two loggerhead turtles were captured (Trent *et al*. 1997). Atlantic sharpnose, blacknose, and blacktip sharks were the dominant shark species caught, and King mackerel, little tunny, and cownose ray were the dominant bycatch species. From 1996 through the first fishing period of 1998, no shark drift gillnet vessels were observed due to administrative problems with observer placement. However, beginning in the second fishing period of 1998, shark drift gillnet fishermen were informed of the requirement to notify NMFS of trips and to carry observers. In 1998, nine sets were observed outside the right whale season, and four fishermen have been taking observers since January 1999.

Because the limited data currently available indicate that this fishery does not have unavoidably large bycatch of protected species and because this bycatch is already regulated under the Endangered Species Act and Marine Mammal Protection Act, this action does not prohibit use of the drift gillnets in Atlantic shark fisheries at this time. This action does establish a 100-percent observer coverage requirement for the southeast drift gillnet shark fishery at all times to improve estimates of bycatch and bycatch mortality of protected species, juvenile sharks, and other finfish. The Biological Opinion issued under Section 7 of the Endangered Species Act requires 100-percent observer coverage during the right whale season (November 1 to March 31) as well as observer coverage for the rest of the year for turtles. This action prohibits use of drift gillnet gear in the Atlantic shark fisheries unless a NMFS-approved observer is on board the vessel.

Ecological Impacts

This action will have no direct ecological impacts. This action will greatly improve the understanding of the population structure, status, life history, and release condition of sea turtles taken incidentally, and will increase data on catch and effort levels in the shark drift gillnet fishery. This action will only support states' efforts to reduce shark drift gillnet bycatch and bycatch mortalities of sea turtles and valuable finfish to a limited extent.

Social and Economic Impacts

This action will have minor social and economic impacts because shark drift gillnet fishermen are already operating under the requirement to carry a NMFS observer, if selected. This action will result in 100 percent selection for observer coverage for all shark drift gillnet vessels at all times. This action will also result in shark drift gillnet vessels being in violation of the regulations if fishing with drift gillnets without an observer on board.

This action will maintain existing enforcement costs and may greatly increase the administrative costs of managing the fishery. Observer coverage costs approximately $600 per day. Effort estimates are not available for this sector of the directed shark fishery, precluding estimation of the total cost of this action. In any case, this expenditure supports collection of data to determine catch and effort levels and to minimize bycatch and bycatch mortality to the extent practicable, and would not necessarily be a permanent expense.

Conclusion

This action is selected because of the considerable need to determine catch, effort, and bycatch rates and mortality in this fishery through the use of observer data. Because interactions with protected species may be relatively rare events (based on Trent *et al*., 1998) and because the endangered right whale and threatened sea turtles are present in the areas in which this fishery operates, 100-percent observer coverage will greatly facilitate monitoring and documenting any interactions with protected species. This action is also selected due to considerable public comment and NMFS' desire to respond to the extent practicable to states's efforts to reduce bycatch and bycatch mortality of juvenile sharks, sea turtles, and other finfish. If bycatch and bycatch mortality of protected species, juvenile sharks, and other finfish is found to be negatively impacting these species, NMFS may consider additional management measures to reduce such bycatch and bycatch mortality.

Rejected Options for Protected Species Bycatch Reduction Measures

Rejected Option: Close critical right whale habitat

NMFS proposed in the draft FMP to close critical right whale habitat to pelagic longline and driftnet fishing as recommended by the Atlantic Offshore Cetacean Take Reduction Team. Considering that no longline trips have been conducted in these areas and driftnets are prohibited in the Atlantic tunas and swordfish fisheries, NMFS will not close these areas. NMFS does not have the authority under the Magnuson-Stevens Act to close state waters and does not seek to pre-empt state regulations in critical right whale habitat. NMFS will evaluate longline fishing activity in the future and will implement measures to reduce interactions between right whales and longline gear.

Designated critical right whale habitat includes the following areas:

- Great South Channel, MA: December 1 to March 31: The area bounded by 41 40' N/69 45' W; 41 00' N/69 05' W; 41 38' N/68 13' W; and 42 10' N/68 31' W
- Cape Cod Bay, MA: February 1 to April 30: The area bounded by 42 04.8' N/70 10' W; 42 12' N/70 15' W; 42 12' N/70 30' W; 41 46.8' N/70 30' W and on the south and east by the interior shore line of Cape Cod, MA
- Southeastern United States: December 1 to March 31: The coastal waters between 31 15' N and 30 15' N from the coast out 15 nautical miles; and the coastal waters between 30 15' N and 28 00' N from the coast out five nautical miles.

Ecological Impacts

This measure would reduce interactions between pelagic longline gear or driftnet gear and the endangered northern right whale. Currently, pelagic longline and driftnet fishermen do not fish in Areas 1 and 2, described above. Due to problems in converting regulatory areas into logbook queries, it is not currently known if pelagic longline fishermen fish in Area 3, although it appears as though this area is too close to shore for longline fishing. (Longline fishing is prohibited in state waters.) There has been no driftnet fishing in Area 3. Therefore, the ecological impact of this measure is minimal given that pelagic longline and driftnet fishermen are not likely to fish in these areas anyway. This would, however, prevent the possible expansion of these fisheries into areas where the number of interactions with northern right whales might be higher.

Social and Economic Impacts

There would be no social and economic impacts of this alternative because longline fishing effort is not occurring in these areas and the driftnet fishery is already prohibited for tunas and swordfish.

Conclusion

This alternative is rejected. There is currently no interaction between longline fishing effort and right whales in these areas.

Rejected Option: Require vessels to haul pelagic longline gear in the order it was set in the Mid-Atlantic Bight between August 1 and November 31

This alternative was recommended by the Atlantic Offshore Cetacean Take Reduction Team to reduce the soak time of a pelagic longline, thereby increasing post-release survival of marine mammals.

Ecological Impacts

This alternative could reduce the maximum soak time of pelagic longline gear by requiring that gear be hauled in the order in which it was set. It is unknown whether this measure could reduce bycatch of marine mammals although that seems a likely result of reducing soak time. This alternative may result in the retrieval of live tuna, which may reduce predation and resulting entanglement by pilot whales. Fishermen may also be able to release entangled marine mammals sooner, thereby improving post-release survival. Bluewater Fisherman's Association estimates that this strategy will result in a ten- to 15-percent reduction in serious injury and incidental mortality of strategic stocks of marine mammals.

Based on NMFS data, it is unclear what reduction in finfish bycatch would result from this alternative. Observers do not currently report the setting/hauling characteristics of pelagic longline sets and therefore it is unknown how many vessels operators haul in the order they set and under what conditions this may be possible.

This strategy would reduce the amount of time that pelagic longline gear can be deployed in the water and thus would reduce fishing effort (hours/hook) for each set. Despite possible benefits of this option, enforcement of this strategy would be difficult. VMS would simplify enforcement, providing set and haul time information in position reports. Since restricting soak time leads to inefficient fishing, it may result in increased fishing effort in the long term. For these reasons, it is not likely to achieve the objectives of the Magnuson-Stevens Act or the MMPA.

Social and Economic Impacts

This alternative is likely to increase costs (fuel) to the 36 vessels that fished in this area during this time of year in the mid-Atlantic Bight, assuming vessels could hold additional fuel. However, AOCTRT members included this measure in the draft

AOCTRP that was submitted to NMFS. A reduction on soak time could reduce catches of target finfish, thereby resulting in a negative economic impact. However, it is more likely that vessels would catch nearly the same amount of target fish over a larger number of total sets.

Public comments received to date on this measure from AP members and fishery participants indicate that this alternative may have serious safety implications due to: 1) hauling additional fuel to compensate for the additional travel time (because of the "run-around" to the top of the line) during a trip; 2) concern about of traveling to the other end of the line in poor weather conditions (i.e., many miles against prevailing winds, currents, etc.); 3) depriving crew of rest; and 4) training crew to return to the beginning of the line. Carrying extra fuel can significantly reduce the stability of a fishing vessel, making it prone to capsizing in rough weather. In addition, it is the decision of the vessel master to decide how to most safely haul longline gear. A regulation which makes that decision for the vessel master may be unsafe.

Conclusion

NMFS rejects this alternative although it was part of the consensus AOCTRP. The AOCTRT did not consider national standards when developing this plan and this alternative does not consider safety of human life at sea including increased fatigue of crew members and decreased stability of the vessel due to the need to carry additional fuel. This alternative could reduce bycatch of marine mammals, however, it is unlikely that the benefits of this measure will outweigh the implications of decreased safety and stability of pelagic longline vessels. Through outreach, NMFS can evaluate whether this is a safe alternative for some pelagic fishermen. If it is safe, NMFS could encourage fishermen to undertake this type of activity.

Rejected Option: Limit the number of pelagic longline vessels

The AOCTRT recommended limiting access to the pelagic longline fishery. Some members of the Pelagic Longline AP also favored limited access to the gear type as part of a comprehensive management strategy for the fishery. This alternative is similar to the limited access program that NMFS is implementing, as discussed in Chapter 4. However, the final actions in this FMP limit access to the permit group by species rather than by gear type.

Ecological Impacts

This alternative attempts to close a possible loophole in the shark/swordfish limited access programs that were proposed in 1996 and 1997, respectively (61 FR 68202; 62 FR 8672). The final version of these limited access programs is presented in Chapter 4 of this FMP.

The pelagic longline fishery is truly a multispecies fishery. Forty-nine percent of total U.S. yellowfin tuna landings and 73 percent of total bigeye tuna landings for 1997 can be attributed to longline vessels. For both species, longline vessels dominate the commercial portion of the fishery; there is also a substantial recreational fishery for yellowfin tuna. Industry representatives to the Longline Advisory Panel emphasized the need to “close the tuna loophole” by including a provision in the proposed limited access program to limit access to other species in the multi-species fishery, notably BAYS tunas. This step will prevent increased discards of shark and swordfish by vessels that are fishing for BAYS tunas, but do not possess a shark/swordfish limited access permit. A limited access program for sharks and swordfish that includes a mechanism for limiting access to BAYS tunas was discussed extensively by the Longline AP. In a report that reflects the Longline AP’s deliberations, NMFS evaluates that alternative as feasible for the fishery, considering the following criteria: 1) consistency with objectives for Atlantic pelagic longline fisheries; 2) integration with other HMS Management; 3) enforceability; 4) administrative and regulatory burden; and 5) degree of constituency support.

Social and Economic Impacts

Social and economic impacts of this alternative are discussed in Chapter 4.

Conclusion

This alternative is rejected. NMFS appreciates the careful consideration of this alternative by the Longline Advisory Panel and the AOCTRT, particularly with regard to providing insight on closing the tuna loophole. However, dolphin fish and wahoo are other important components of the longline catch in some sectors of the fishery (Cramer, 1996), and these species are managed by the South Atlantic and Gulf of Mexico Fishery Management Councils, separate from Secretarial management of Atlantic tunas, swordfish, and sharks. The limited access program discussed in Chapter 4 addresses the concerns of the Longline Advisory Panel and AOCTRT, while also supporting other objectives of this FMP. Additional action to limit access to species that are not under direct Secretarial management (e.g., dolphin fish and wahoo) would require cooperative action by NMFS and the Councils, and could be considered in future actions.

3.5.4 A Strategy for Future Bycatch Reduction

This FMP includes actions to reduce bycatch in HMS fisheries. A combination of time/area closures for pelagic longlines, gear modifications, limited access, voluntary modifications in behavior, gear research, and counting dead discards against all quotas, are used for the near term. In addition, further time/area closures are contemplated. These tools will continue to provide the mechanism by which bycatch will be further reduced.

NMFS data collection programs include long-term collection of catch and effort data by gear type and species through observer coverage and self-reporting(logbooks). NMFS is not prepared to set a target or uncertainty threshold for bycatch reduction at this time. Instead, NMFS has identified the bycatch issues of highest priority and has implemented management measures to address those concerns in this FMP. In the future, NMFS may work with the Advisory Panels to assess bycatch reduction targets and thresholds, and identify acceptable levels of uncertainty for bycatch estimates. The annual SAFE Report on HMS stocks will summarize the bycatch statistics in HMS fisheries. NMFS and the AP will evaluate the effectiveness of this bycatch reduction strategy based on this summary. Advanced technology will facilitate future reporting and NMFS will continue to work with fishery participants to improve the quality of data related to bycatch and bycatch mortality.

NMFS will also continue to support research on bycatch reduction management measures, including additional gear modifications. Modifications to increase the selectivity of fishing gear often provide an effective tool for reducing bycatch in all fisheries. HMS supports research projects that will help to determine the efficacy of certain gear modifications with respect to bycatch and bycatch mortality. For example, NMFS is currently supporting research to determine if different levels of hooking mortality result from different hook types in the pelagic longline fishery. Other important areas for future research include gear deployment issues and post-release survival in recreational and commercial HMS fisheries as well as models of currently unknown mortality on HMS stocks due to bycatch in other fisheries. In July 1998, the HMS AP discussed the use of different gear types and gear deployment methods to reduce catch and mortality of non-target species in HMS fisheries. Panel members were very interested in gear modifications and encouraged NMFS to continue to support gear modification research and information dissemination to commercial and recreational fishery participants. Most AP members felt strongly that non-regulatory mechanisms would be more effective and more acceptable to the fleets than would be regulations mandating the use of a particular gear type or deployment method. The final actions in this bycatch reduction strategy reflect that approach, in part. The FMP framework contains provisions to implement gear modification measures as new information becomes available supporting such regulatory measures. Several AP members have noted the importance of educating fishery participants and giving them a stake in fishery conservation actions without creating new regulatory, enforcement, and administrative burdens. This FMP includes an outreach program that focuses on bycatch issues in HMS fisheries.

Studies have indicated that discarded catch is often not reported as accurately as landed catch (Cramer *et al*., 1997). In some HMS fisheries, a logbook program may provide better information than a limited observer program for a far-ranging fishery. In other instances, an observer program can provide important information that logbooks do not such as gear modifications or other catch parameters that are not recorded in logbooks or may not be as accurately reported in logbooks due to the attention of the captain to marketable species, rather than unwanted species. As data on catch, discards, and landings improve, fishery managers can better determine appropriate measures to pursue bycatch reduction goals (NMFS, 1998b). Long-term data collection programs to evaluate these management measures are particularly imperative in HMS fisheries, given the temporal and spatial variability of the fisheries and of bycatch.

All bycatch estimates have some variability based on the robustness of the data used in calculations. A level of acceptable probability (certainty) could be set to determine the level of confidence that can be placed in the recovery estimates to ensure that bycatch is minimized, to the extent practicable. However, bycatch estimates will continue to be made based on widely varying data sources, that depend on the species of interest and the fishery. Collection of statistically robust data is problematic for wide ranging species that are not subject to fishery-independent sampling. Further, stock-wide bycatch data are not currently available from ICCAT. Discard data submitted to ICCAT for Atlantic tunas and swordfish may be associated with large variance estimates due to differences in national data collection programs. Using the bycatch strategy in this FMP as a platform, NMFS intends to continue to address bycatch concerns both domestically and internationally, including increasing data collection through observer programs, time/area closures, and gear modifications.

3.6 Interim Milestones (During Recovery)

The following alternatives address what actions should be taken to assess progress toward recovery during the rebuilding period. During rebuilding, two considerations are of primary importance: what to do with “windfalls;” and how to select and implement mid-course corrections in the event that the trajectory deviates from the predicted path. Windfalls are unexpected stock surpluses. Managers must decide whether benefits from these unexpected surpluses should be subject to fishing mortality immediately, or whether they should be left alone and allowed to contribute to more rapid rebuilding.

Stock assessment is the primary tool that will be used to evaluate the progress of stock rebuilding during the recovery period. Managers need to consider how frequently these assessments should be conducted as well as that type of course-correcting action should be taken if recovery is not on schedule. It should be noted that for tuna and swordfish, stock assessments are conducted at the international level and thus, scheduling of assessments is not under direct control of NMFS. In addition, as described in Section 3.10, a SAFE report must be published annually. Each SAFE report will either summarize information that has become available since the last stock assessment or include any results of the last stock assessment.

Final Action: Conduct a stock assessment for each species or species group every two to three years

Swordfish

Assessment of swordfish resources by SCRS has customarily been performed every two years. The most recent Atlantic swordfish stock assessment was completed in 1996 and included data specific to the north and south Atlantic stocks. The next assessment is scheduled for 1999 and SCRS scientists are working to improve data collection. This assessment will use sex-specific catch statistics, catch per unit effort patterns from all fleets across the north/south stock boundary, and relative abundance trends from the Portuguese fleet. The international coordination required to complete an assessment of swordfish resources throughout the Atlantic Ocean must be considered in relation to reporting frequency needed to adequately track rebuilding progress. Information on Atlantic swordfish landings by the United States will be updated more frequently as needed to assess the efficacy of unilateral management measures.

Atlantic Tunas

Assessment of the west Atlantic bluefin tuna stock by SCRS typically takes place every two to three years. The most recent assessment was completed in October 1998. The rebuilding program adopted by ICCAT in 1998 specifies that in 2000, and thereafter every two years, SCRS will conduct a stock assessment of west Atlantic bluefin tuna and provide advice relative to the rebuilding program. If SCRS determines that a TAC greater than 2,700 mt ww will allow the maximum sustainable yield target to be achieved within the 20-year rebuilding period with a 50-percent or greater probability, or if a TAC less than 2300 mt ww is necessary to achieve the maximum sustainable yield target within the 20-year rebuilding period with a 50-percent or greater probability, then ICCAT may consider adjusting the rebuilding plan accordingly.

Yellowfin tuna and bigeye tuna and albacore tuna are assessed by ICCAT's SCRS periodically. Under this final action, NMFS will recommend that assessments for any overfished tunas be conducted on a more regular basis.

Atlantic Sharks

Stock assessments of the large coastal shark management group have been conducted every two years since 1992 by NMFS' Southeast Fisheries Science Center. An assessment took place in June 1998, the results of which are discussed in Section 2.4.1 and the executive summary is included in Appendix IV. A stock assessment has not been conducted for small coastal sharks or pelagic sharks since before the 1993 FMP. SCRS is conducting a catch rate workshop for pelagic sharks in 1999. This final action will ensure that small coastal sharks and pelagic sharks are assessed as regularly as large coastal sharks. This final action may allow for an assessment of large coastal sharks one year, followed by small coastal sharks the next year, and pelagic sharks the following year. However, for many shark species, particularly pelagic sharks, assessments should be conducted on an international level.

Conclusion

Regular HMS stock assessments are crucial in order to define stock boundaries, to meet recovery period goal, to estimate life histories, and to improve knowledge of stock dynamics.

Final Action: Flexible "framework" for adopting management measures

This action gives NMFS the flexibility to consider different management methods in order to alter fishing mortality when rebuilding is off schedule. It allows a wide range of alternatives to ensure that recovery is achieved within the specified time period, such as adjustments to retention limits, minimum sizes, fishing seasons, time/area closures, etc. In addition, this flexibility also allows managers to consider alternatives that may have fewer social or economic impacts. There will still be a stock assessment completed every two to three years but this alternative will involve various layers of agency review and public input to change the current management measures which may alter the current fishing mortality rate. The FMP framework is more process-oriented, and less trigger-oriented, in determining remedial management. In addition, this action does not preclude NMFS from following the “20-percent rule” which NMFS has rejected at this time.

Conclusion

This alternative is selected because it allows managers the flexibility to choose management measures which may have fewer economic or social impacts while still rebuilding overfished stocks while still decreasing fishing mortality.

Rejected Options for Interim Milestones

Rejected Option: Annual stock assessment

Although a number of constituents have requested annual stock assessments, this alternative is rejected at this time for all HMS. This alternative would provide a mechanism to closely track rebuilding of HMS, however this frequency of stock assessment is considered unnecessary to track trends in stock size. This alternative would require an annual assessment of each HMS. Logistical constraints on conducting assessments and compiling information from all countries landing HMS may limit assessment frequency. In addition, due to the slow change and the low level of precision in some HMS assessments, very little can be learned about changes in HMS stocks from one year to the next. Thus, this alternative would not result in an efficient use of scientific research and monitoring resources for HMS.

Logistical constraints on conducting assessments and compiling information from all countries landing HMS may limit assessment frequency. This alternative is not consistent with the SCRS schedule. Finally, assessments of ICCAT species are not conducted on a regular basis, thus this alternative may not be realistic.

Conclusion

This alternative is rejected because it does not conform to current international standards. In addition, for long-lived HMS annual stock assessments are an unnecessary burden that exceeds any benefits because of difficulties associated with measuring inter-annual changes. For these reason, and because of logistical constraints, multi-year periods between assessments are preferred.

Rejected Option: Stock assessment when new information becomes available

This alternative would require a stock assessment when new scientific information becomes available. This alternative could require assessments at a frequency that poses significant administrative costs and that may represent an inefficient use of assessment resources. However, it would allow for an increase in response time if recovery was hampered by environmental fluctuations (e.g., decreasing recruitment) or by delinquent fishing practices (e.g., quota overharvests). NMFS prefers to establish a rebuilding program with a constant catch strategy. Therefore, an assessment will not be necessary more frequently than every two to three years.

Conclusion

This alternative is rejected because it involves significant administrative costs and may represent an inefficient use of resources.

Rejected Option: Fixed trajectory and milestones to keep on trajectory

This alternative would require a stock assessment every two years. Modifications to the recovery trajectory and milestones would be made by the agency in accordance with the guidelines and "triggers" built into the FMP. Under this option, if it is determined that the stock is not on its intended recovery trajectory, then immediate corrective action, perhaps including international action, would be required by the agency to return the stock to its recovery course. Milestones would be quantifiable, and would be tied to pre-determined quantified adjustments to get back on recovery trajectory. At its March 1998 meeting, the HMS AP suggested 80 percent of the biomass necessary to support the maximum sustainable yield in half of the selected rebuilding period as a "hard and fast" milestone. If recovery fell behind schedule, then an adjustment to the fishing mortality rate would be implemented to put the recovery back on track. If recovery was ahead of schedule, the FMP could provide the flexibility to increase fishing pressure or leave these "extra" fish "in the bank" to accelerate recovery. SCRS and NMFS would be responsible for providing biennial or annual analyses, with appropriate confidence limits, providing information on alternative measures (such as quota changes, catch composition between small and large fish, minimum sizes, etc.) to stay on trajectory. NMFS would then be responsible, in accordance with the FMP framework, for implementing the necessary and appropriate management measures.

Conclusion

This alternative is rejected because it is inflexible and is not consistent with international management strategies. The final actions will allow NMFS to maintain the rebuilding projections and make any necessary changes without the rigid structure of this alternative.

Rejected Option: 20-Percent Rule

This alternative would trigger more restrictive regulatory constraints on fishing mortality if an assessment indicated that the recovery pace were 20 percent below expected levels. When two consecutive assessments indicate that recovery is on or ahead of schedule, NMFS, with input from the AP, may consider changes to the recovery schedule to take advantage of the unexpected benefits. Such changes must include consideration of the best scientific information available, expected social and economic impacts, international concerns, confidence intervals, and enforcement concerns.

Conclusion

This alternative is rejected because it does not consider differences in the international stock assessment strategies. Under the final action selected, managers may use 20 percent as a threshold or be more flexible, as advised by the SAFE report, ICCAT, and the AP.

3.7 Uncertainty Issues

All metrics used in estimating the recovery trajectories have associated variations based on the quantity and quality of the data used in stock assessments. A level of acceptable probability (certainty) must be set to establish targets and to determine the level of confidence that can be placed in the recovery estimates to ensure that stocks are rebuilding within the constraints established by the Magnuson-Stevens Act (e.g., probability of less than X percent of reducing the resource below the minimum stock size threshold within the recovery period).

Final Action: For any management action under consideration, management should be *at least* 50 percent sure of the desired effect.

Under this action, NMFS will choose management measures that have *at least* a 50-percent confidence in target reference points (MSST, MFMT, F_{MSY}, B_{MSY}) utilized in developing rebuilding projections. If there are alternatives that have a greater than 50 percent probability of success, NMFS will prefer the alternative with a greater than a 50-percent confidence unless there are strong reasons to do otherwise (e.g., international agreement, a small increase in percent confidence has much larger economic impacts than the other option) or the SAFE report recommends a different level of confidence based on data concerns. In all cases, NMFS will strive to be as risk-averse as possible. The Technical Guidelines suggest that rebuilding plans should be designed to possess a 50 percent, or higher, chance of achieving B_{MSY} with the rebuilding time frame. In addition, the Technical Guidelines recommend that the probability of exceeding the minimum fishing mortality threshold be no greater than 20 to 30 percent, and certainly smaller than 50 percent. Thus, this final action is consistent with the certainty levels described in the Technical Guidelines.

Collection of statistically robust data is problematic for an international fishery like HMS that are not targeted by fishery-independent sampling. In addition, data submitted for Atlantic HMS may have large variance estimates due to differences in data collection programs.

Atlantic swordfish

The Atlantic swordfish stock assessment model simulations indicate a high degree of robustness to life history parameters but sensitivity to large changes in catches and catch per unit effort. This may indicate some uncertainty in results (SCRS, 1996). SCRS has determined that there is a high probability that the swordfish population is significantly below its optimal level. The uncertainty of the model increases when the model assumes the biomass is below B_{MSY}. Because of this uncertainty, SCRS will discontinue model projections, based on some models, if the swordfish biomass is reduced below $0.20B_{MSY}$.

Atlantic tunas

This final action describes the current standard used by SCRS for its projections of west Atlantic bluefin tuna stock status. For example, the status quo total allowable catch for the west Atlantic bluefin tuna fishery of 2,500 mt ww carries with it a 50-percent probability of doubling the spawning stock biomass in 20 years based on the two-line model. SCRS has not developed recovery scenarios for bigeye tuna, but does use the 50-percent probability trajectory when projecting catch and spawning stock biomass levels under various fishing mortality levels.

Atlantic sharks

In 1997, NMFS used a 50-percent probability level that no further stock declines would occur when it reduced the large coastal shark commercial quota and recreational retention limit as an interim measure until a long-term rebuilding program could be developed. This level of certainty was acceptable for an interim measure, especially given the impacts of such a quota reduction on fishermen and their communities. However, in developing the rebuilding program for large coastal sharks, NMFS used a 70-percent probability *as a guide* in order to ensure that the intended results of a management action are actually realized (Section 3.4.1). Conversely, NMFS used a *low* probability of a *negative* outcome as an additional guide in evaluating potential management measures (e.g., less than a 20-percent probability that stock sizes would decrease under a given management measure).

Conclusion

This alternative is selected because it provides assurance that rebuilding will occur despite uncertainties associated in stock assessments. Setting a 50-percent uncertainty level instead of a higher level may mitigate any potential impacts on the fishery and fishermen while still meeting the requirements of the Magnuson-Stevens Act. In addition, this alternative allows NMFS to meet ATCA and other international agreements.

Rejected Options for Uncertainty Issues

Rejected Option: For any management action under consideration, management should be 80 percent sure of desired effect.

While this alternative is more risk-averse than the final action, it is not always realistic given the international management of many HMS and the best scientific information available. However, the final action described above does not preclude NMFS from making decisions based on an 80-percent probability of success. As explained in the final action, NMFS will strive to achieve confidence levels of at least 50 percent for all management actions.

Conclusion

This alternative is rejected because it does not consider international agreements. In addition, this level of certainty is often times unrealistic given the currently available analyses on many HMS.

3.8 Monitoring, Permitting, and Reporting

3.8.1 Introduction

Both the Magnuson-Stevens Act (16 U.S.C. 1801) and ATCA (16 U.S.C. 971) authorize the Secretary of Commerce to collect information for the purpose of managing HMS fisheries. ATCA requires NMFS to establish collection of comparable real-time data on recreational and commercial catches and landings through the use of permits, logbooks, landing reports, for charter operations and tournaments, and programs to provide reliable reporting of the catch by private anglers. National Standard 9 directs NMFS to conduct "a review, and where necessary, an improvement of data collection methods, data sources, and applications of [bycatch] data." The collection of ecological, economic and sociological information about HMS fisheries enables NMFS to evaluate the effectiveness of current regulations, monitor compliance, and analyze potential management measures to rebuild overfished stocks and maintain stocks at optimum yield. In addition, fishermen and other constituents often request access to these data to learn more about their fisheries. Permitting and reporting requirements that were in place prior to this FMP are described in Section 2.6. As required by the Magnuson-Stevens Act, Chapter 1 specifies the nature and extent of scientific data that are needed for effective implementation of this FMP. Obtaining new information may also involve additional costs to the regulated community. This section presents alternatives for changing the permitting and reporting requirements in HMS fisheries. The associated analyses discuss ecological, social and economic impacts of the alternatives that were considered by NMFS.

The ecological impacts of these final actions are expected to be positive. Better information about effort, catch, bycatch and discards can only improve NMFS' ability to manage sustainable fisheries. The social and economic impacts, on the other hand, are mixed. There will likely be social and perhaps economic impacts on fishermen from increased permitting and reporting requirements (e.g., permit fees, labor required to complete logbooks, travel expenditures to attend workshops, expenses associated with hosting an observer). However, increased permitting and reporting requirements may have longer-term positive social and economic consequences. For example, new reporting requirements could improve the long-term economic outlook of HMS fishing communities to the extent that newly collected information contributes to rebuilding fisheries which will benefit fishing-dependent incomes and activities. Collection of additional social and economic data also helps NMFS assess the potential effects of various alternatives, improving the agency's ability to make decisions that minimize negative social and economic impacts to HMS fisheries. NMFS can authorize activities otherwise prohibited by this FMP for the purposes consistent with the EFP provisions of 50 CFR part 600.745.

3.8.2 Monitoring, Permitting and Reporting Measures

The following alternatives do not have significant safety at sea implications, with the exception of the action that requires vessel monitoring systems on pelagic longline vessels. These systems increase safety at sea due to improved communication with shore (depending on the hardware), and very accurate position locations. It could be argues that completing logbooks poses a safety threat because it requires time that could be used to maintain equipment or address other safety issues while at sea. However, typical captains keep a master log. Therefore, NMFS does not consider logbook reporting to be a significant safety threat when captains are already collecting the necessary information.

Final Action: Require all tuna vessels, commercial shark and swordfish vessels, and charter/headboat vessels to obtain an annual vessel permit

This requirement has been in place for all tuna vessels and for commercial shark and swordfish vessels. This action extends that measure to require all charter/headboat operators to obtain a vessel permit in order to fish for HMS.

Ecological Impacts

This action enables NMFS to monitor commercial and recreational landings and catch and release statistics more accurately, thereby enhancing HMS management and research efforts. The total universe of recreational fishermen, and their effort, catch and bycatch (including discards) is presently unknown. Estimates of some of these parameters are currently made using survey instruments, such as the Large Pelagic Survey and the Marine Recreational Fisheries Statistics Survey, as well as voluntary reporting from tournaments. A charter/headboat permit system will greatly improve information available to NMFS regarding the recreational HMS fisheries by providing an accurate measure of participation, effort, catch and bycatch (including discards) from one of its most significant components.

Social and Economic Impacts

There is an economic impact associated with the permit. Currently shark and swordfish commercial permits cost $40 plus $10 for an additional permit. The charter vessel owner will be charged a fee for the vessel permit (probably $20 to $40) to cover administrative costs. In addition there are administrative costs associated with processing permits, as well as enforcement costs in ensuring that charter vessels are complying with permit requirements. In terms of sociological impacts, some charter vessel captains and/or owners may have a negative reaction to a management alternative that requires additional paperwork and regulatory burden on their business operation. Requiring permits of recreational fishermen reduces the administrative costs of increasing the sampling of the Large Pelagic Survey and increases the reliability of estimates made from that survey.

Conclusion

This final action greatly contributes to NMFS' collection of data from a significant number of HMS fishery participants at a relatively small social and economic cost. Permits allow NMFS to understand the extent of the universe of fishermen and to better serve those constituents.

Final Action: Require commercial shark and swordfish vessels and charter/headboat vessels to submit logbooks for all HMS trips

If selected, all of the above mentioned vessels will be required to complete an HMS logbook (pelagic logbook for commercial fishermen, charter logbooks for charter/headboat vessels). NMFS currently selects all commercial shark and swordfish vessels, and at least initially, may select all charter/headboat vessels. These permitted vessel owners are responsible for submitting logbook reports, including trip summaries, with catch and effort data and discard information. Logbooks must be completed before offloading of HMS species in the case of one-day trips, or within 48 hours of each day's fishing activity (or before offloading) in the case of multi-day trips. In the short term, NMFS will be utilizing existing forms for charter/headboat reporting, which include the Northeast Multispecies logbook and the Southeast Charterboat logbook. After NMFS evaluates the usefulness of these forms, NMFS may decide to establish a separate form for HMS Charter/headboat operators. Charter/headboat operators who already submit the required logbooks under the Northeast Multispecies or Southeast Charterboat Permit programs do not need to submit additional data at this time to NMFS. HMS will coordinate data analysis of these forms with the regional offices and science centers. All collected information is kept confidential but may be used in summary format.

Ecological Impacts

Logbooks are used to estimate catch and effort statistics that are reported to ICCAT by gear type and used in stock assessments. These stock assessments are being used to create rebuilding scenarios and establish sustainable quotas. Existing charter logbooks collect information comparable to that currently collected from the billfish tournament reporting form and the pelagic logbook used for commercial gear: fishing location; gear; measures of effort (number of lines, hours fished, etc.); and number and disposition of catch (discarded dead, discarded alive, tagged, or kept) for each tuna, shark, swordfish, or billfish caught. Information such as the vessel's name and permit number identify the fisherman. Information on the number and size of fish is used to assess total and average weight of the target species being harvested. The effort expended allows estimation of catch per unit effort, an important component of stock assessments.

Social and Economic Impacts

The logbooks require some of the captain's time to fill out and send to the appropriate NMFS office. However, public comments have indicated significant support for this alternative among vessel captains, including charterboat captains due tot he importance of collecting this type of data for stock assessments. Many captains already fill out such logbooks and many view faxing their report to NMFS a small burden when weighed against the benefit of supporting more effective HMS management. In terms of social impacts, some vessel captains and/or owners may have a negative reaction to a management alternative that requires additional paperwork and regulatory burden on their business operation, especially in times of heavy fishing activity when maintenance and safety are crucial. Logbook data submission by fishermen reduces NMFS administrative costs to collect data.

In addition there will be administrative costs associated with processing logbook information, as well as enforcement costs in ensuring that vessels are complying with logbook requirements. This program is costly to maintain because data must be compiled, entered, and analyzed for trends in catch and effort. However, fishermen supply information that must be reported to ICCAT and therefore is necessary to rebuild overfished HMS stocks and to maintain stocks at optimum yield.

Conclusion

Logbook data forms the basis of NMFS' data collection efforts at a relatively small social and economic cost. In reference to the "new" provision which includes charter/headboats in this requirement, many of these vessels that fish for HMS already submit logbooks for other fisheries and/or maintain private logbooks to record their fishing activity. Therefore, NMFS expects that the benefits of collecting these data outweigh the potential burden on fishermen.

Final Action: Require completion of logbook forms before offloading (for one-day trips) or within 48 hours of each day's fishing activities (for multi-day trips)

Those vessels required to fill out logbooks must complete the logbook forms before offloading of HMS in the case of one-day trips, or within 48 hours of the completion of a day's fishing activities (or before landing) in the case of multi-day trips. Longline vessels frequently soak gear overnight and haul in the morning. Logbooks must be completed for a particular set within 48 hours of haulback, no matter what time of the day the haulback occurs. This measure is expected to increase the enforceability of HMS regulations, particularly in the case of at-sea boardings, and to reduce error in reporting.

Prior to the implementation of this FMP, longline vessel operators were required to submit logbook forms within seven days after the sale of swordfish offloaded after a trip, or within five days after the sale of shark offloaded after a trip. In this FMP, NMFS extends the logbook requirement to tuna fishery participants who are permitted to use longline, hand gear, and purse seine gear. Extension of the logbook requirement to tuna permit holders was initially proposed in the proposed consolidation of HMS regulations (61 FR 57361; November 6, 1996) and public comment was solicited at that time. The measure was re-proposed in the proposed rule that accompanied the draft FMP. Current regulations require that those vessels that are selected by NMFS must submit logbooks. NMFS commonly selects 100 percent of longline vessels for reporting. It is anticipated that a smaller number of tuna permit holders, perhaps ten percent, will initially be selected for logbook reporting in order to assess the efficiency and effectiveness of the new requirement.

Ecological Impacts

Enforcement is a key component of HMS management. On occasion, there is a need for a law enforcement officer to observe the logbook of a pelagic or bottom longline vessel during or immediately following a trip. However, under the regulations in place prior to this FMP, submission of the logbook was required not later than the seventh day after sale of the swordfish off-loaded from a trip or no later than the fifth day after sale of the shark off-loaded from a trip. This new measure will increase enforceability of all pelagic and bottom longline fishery management regulations by facilitating inspection of logbooks during at-sea or dockside inspections. It is also likely to discourage fraudulent data reporting, and reduce erroneous discard reporting that may occur due to poor recollection of when, where, and how many fish were caught on a particular set during a multi-day fishing trip.

Social and Economic Impacts

This measure does not impose any additional reporting requirements. Prior to implementation of this FMP, fishery participants were required to retain information for logbooks and submit their logbooks within a certain time after offloading. This measure may cause some additional inconvenience by requiring more timely completion of the logbook form. However, it is not likely to substantially increase the reporting burden for fishery participants. This measure will facilitate enforcement both at sea and at the dock and reduces the administrative costs of enforcement efforts.

Conclusion

This is the final action. NMFS proposed that logbooks be completed within 24 hours, but re-considered when comments were received indicating potential safety implications of the proposed measure. NMFS, therefore, implements the 48 hour requirement which should provide for accurate data reporting and satisfy the enforcement objective while mitigating the safety concerns. Implementation will result in more timely and accurate reporting of catch and bycatch rates of immature fish or other regulatory or market-driven discards in the pelagic and bottom longline fishery, consistent with NS 9.

Final Action: Require tournament registration for all tournaments that land shark, swordfish, and tunas

This action requires tournament operators to notify NMFS of the purpose, dates, and location of any tournament involving score-keeping or awards for the capture of Atlantic tunas, swordfish, and sharks at least four weeks prior to commencement of the tournament. NMFS may select tournaments for mandatory reporting as well as registration. In the past, NMFS has worked with tournament operators to collect data in the past on a voluntary basis, however, there was no way of identifying the universe of tournaments and therefore, assessing fishing effort. NMFS may continue to sample tournaments on-site but this collection of data will allow NMFS scientists to focus on analysis of data and rely on fishermen to collect the data for NMFS.

Ecological Impacts

Requiring tournament operators to provide notification allows NMFS to improve monitoring of recreational fishing catch, bycatch, and effort for tunas, swordfish, and sharks and therefore, this requirement supports rebuilding of these species. A similar measure was implemented as an interim rule for Atlantic billfish (63 FR 14030; March 24, 1998) and as a final action in Amendment One to the Atlantic Billfish FMP. NMFS may select tournaments for mandatory reporting as well as registration. In this respect, NMFS can select times/areas to collect bycatch information to more accurately characterize bycatch in tournaments, which do not reflect non-tournament fishing patterns.

Social and Economic Impacts

This requirement imposes a paperwork burden on tournament operators to register their tournaments, and if selected, submit data on tournament catch and effort. However, most tournaments probably already collect catch and effort data and this requirement may not impose an economic burden on tournament operators. Tournament registration and reporting requirements reduce the administrative costs to monitor tournament fishing effort. The administrative costs of this final action include compiling and analyzing data and submitting that data for use in stock assessments, if necessary. NMFS has worked with tournament operators to collect data in the past on a voluntary basis and therefore many tournament operators should not experience a social or economic impact from this final action.

Conclusion

This action will greatly improve NMFS' collection of data from a significant segment of the recreational HMS fishery at a relatively small social and economic cost. The tournament notification measure is critical to developing a sampling frame for tournaments to allow for better monitoring, data collection, and reporting of HMS tournaments. This requirement is comparable to the logbook data that is submitted by charter/headboats, and commercial shark and swordfish fishermen in that it collects catch and effort information as well as the disposition of the catch by individual fish.

Final Action: Require the use of a vessel management system (VMS) on all pelagic longline fishing vessels

This action requires the owners and operators of all vessels fishing with pelagic longline to submit position reports hourly using a VMS. VMS is an electronic tool that is programmed to transmit a global positioning system position report. NMFS has approved certain VMS units for use in the Atlantic pelagic longline fishery. Tracking a series of signals allows NMFS to determine the location and travel pattern of a vessel. This tool is particularly useful in enforcing time/area closures which directly reduce bycatch, and has added safety and economic benefits. Personal computers could be linked to VMS units voluntarily, providing fishermen with better communication and possible electronic logbook reporting in the future. VMS is mandatory in the New England scallop fishery and in the Hawaii pelagic longline fishery; both programs have proved very helpful in enforcing time/area closures.

This action eliminates the need for all swordfish to be offloaded by the closure time of the directed fishery closure provided that no fishing activity of any kind takes place after the closure until all swordfish are offloaded. In addition, this action allows pelagic longline fishermen to be exempt from the retention limit regarding incidental catch of swordfish during a directed fishery closure. Therefore, pelagic longline fishermen can possess more than 15 swordfish on board in the north Atlantic Ocean during a closure of the north Atlantic directed swordfish fishery, provided that the swordfish were caught south of 5 N.

Ecological Impacts

This action will reduce the resources needed by NMFS and the USCG to enforce time/area closures. Utilizing VMS will effectively increase the efficiency of enforcement activities and may increase compliance with conservation measures. Without VMS, time/area closures can be very difficult and expensive to enforce, requiring at-sea and flyover monitoring of the fleet. VMS is particularly useful if the area is large and/or transit through the area is permitted. VMS is considered a very successful aid to enforcement in other fisheries where it is used. The ecological cost of not enforcing a time/area closure effectively is further depletion of fully or overfished stocks with longer times to rebuilding. VMS may also allow more finely defined closure areas vs. the closure of large blacks.

This alternative will not result in increased catches of non-target finfish, although fishermen would be allowed to fish up until the date and time of the closure. Their estimated catch rates of swordfish will be considered when season projections are made for closures.

VMS could be used in the future for inseason quota monitoring, decreasing the likelihood of premature closure and quota overharvests. VMS could also be used by observers to report takes of protected species. This information could be shared with fishermen in nearby areas, thereby resulting in lower marine mammal bycatch rates.

Social and Economic Impacts

In response to comments and through further research into newly available technologies, NMFS has changed the proposed requirements for the specifications of vessel management units and communications service providers. VMS may cost as little as $1,800 (ARGOS unit) or as much as $3,500 per unit and installation can cost $100 - $1,000 (ARGOS and INMARSAT-C, respectively). Communication costs on the ARGOS units may cost a little as five dollars per day with no charges when the vessel is in port (i.e., not fishing). Communication costs for data position reports only (no text messages included) will cost approximately $2.50 per day on the INMARSAT-C units, however, every day the unit is on will be charged. These costs will be assumed by the vessel owner. If fishermen choose an INMARSAT unit, an optional personal computer for real-time logbook reporting could be linked to the VMS at a cost of approximately $2,000. ARGOS presents fishermen with a less costly alternative to VMS but does not allow for two-way communication. There is a safety feature of both the ARGOS and the INMARSAT-C units, which allows the fisherman to activate an “EPIRB-type” signal on the unit. Vessels could be required to pay for upgrades to the system, however, it is not anticipated at this time that upgrades would be necessary. Both ARGOS or INMARSAT-C units are able to accommodate for electronic catch reporting, if NMFS seeks to implement that program in the future. At this time, NMFS does not consider the information provided by the VMS to be duplicative with logbook data. The VMS allows for near real-time data collection and accurate position reports.

VMS has several social and economic benefits, namely that it provides a secure communication system and an emergency beacon and position report (immediate global positioning system distress signal), if needed. VMS would benefit fishermen, and safety of human life at sea, by increasing communication with markets, family members, vessel owners, and the Coast Guard. Fishermen may also be eligible for benefits for cooperating with the NOAA Weather Service via their VMS. In addition, VMS could allow confidential real-time logbook reporting if a personal computer is linked to the system which could decrease the paperwork burden on fishermen, observers, and NMFS. The economic impacts of the VMS program are necessary to implement the time/area closures effectively. VMS can also increase revenues by allowing less burdensome regulations and more fishing time (up to the time of a closure instead of being in port by the closure). However, the cost of a VMS unit may be considered burdensome by fishing vessel owners, particularly by those vessels operating at the margin. (See Chapter 2 for a full description of the social and economic characteristics of the longline fleet).

VMS offers an administrative benefit to NMFS as well. The NMFS observer program frequently has difficulties is assessing where vessels are fishing. The goal of the observer program is to place observers on vessels in a stratified sampling scheme depending on location of the trip. The VMS will allow managers to coordinate for observer sampling and coverage in order to achieve coverage goals. Often, fishing vessel operators are documented for not notifying NMFS of the trip start date in time to initiate observer coverage. With VMS, NMFS can identify trips that have started without the required observer and can seek further enforcement of observer regulations.

For some time, fishermen have requested that NMFS provide delayed offloading provisions instead of a fixed closure date by which all fishermen must be at port and offloaded. Fishermen and dealers maintain that requiring all fish to be offloaded by the time of a closure creates a market glut, even though fishermen are notified 14 days in advance of a closure and could avoid the glut by coming in early. Transportation and storage problems also result from a “drop dead” closure date because all fish must be offloaded and dealers then must be able to provide for shipping or cold storage space. NMFS established a pilot program for delayed offloading with VMS in 1998. Only one pelagic longline vessel owner participated in the pilot program, so results are difficult to predict. Each year, there will be varying conditions under which delayed offloading is more or less profitable (i.e., may depend on imports or Canadian closures, etc.). NMFS estimates that with all pelagic longline vessels sending position reports, regulations may not have to be as restrictive for enforcement reasons and fishermen may further benefit economically. For example, it is currently illegal to possess greater than 15 swordfish in the north Atlantic during a directed fishery closure. Although these swordfish may have been caught in the south Atlantic during an open fishery, enforcement agents have no way of proving the location of the catch. With VMS, each vessel will be tracked and longline sets could be assigned to ocean areas, thus supporting that the swordfish were actually caught in the south Atlantic. This is expected to lower costs to distant water fishermen who no longer have to offload in a foreign country in the south Atlantic.

Conclusion

This is a final action. VMS is essential to effective implementation and enforcement of a time/area closure. Further, this final action implements the ICCAT recommendation for VMS. VMS also provides benefits of better communication with shore and with other ships as well as increased safety benefits. This measure may require a substantial one-time cost for some small businesses, however, this cost is a necessary component of rebuilding the north Atlantic swordfish stock and restoring the full long-term economic vitality of the fishery. Leasing is probably not possible at this time, although if the industry worked with the VMS distributor, a leasing arrangement might provide a more attractive economical option to vessel owners. In addition, if vessel owners can afford VMS, economic benefits may increase due to less restrictive regulations.

Final Action: Mandatory observer coverage in the Atlantic tunas fisheries and commercial shark and swordfish fisheries, if selected

This measure requires all tuna vessels, and commercial shark and swordfish vessels to take an observer on a trip, if selected. The purpose of this measure is to collect catch, bycatch, and effort information from these fisheries.

Ecological Impacts

This action is expected to have beneficial ecological effects for both HMS and other living marine resources that interact with HMS. Observers are deployed on fishing vessels to gather ecological information about the composition and character of the total catch, both landed and discarded. This information supplements logbooks, call-in reporting, and dealer reporting and is particularly valuable for collecting information about that portion of the catch that is not brought to shore. This action also supports NMFS' implementation of NS 9 in HMS fisheries because it allows for collection of information about bycatch. Data collected under this alternative will allow NMFS to explore management measures that support requirements of the Magnuson-Stevens Act, National Environmental Policy Act, Marine Mammal Protection Act, and the Endangered Species Act, as well as the objectives of this FMP. These data enhance stock assessments as well as improve the effectiveness of management measures.

Social and Economic Impacts

This action bears some cost to vessel operators. Vessel operators are required to house and feed observers at the same standard provided to the rest of the crew. Vessel operators must also make all fish available to the observers which may slow down the pace of fishing operations. However, most of the implementation costs are covered by NMFS, e.g., training and employing observers. A single day of observer coverage costs approximately $650 although that cost is variable depending on the characteristics of the fishery and the observer program. Safety at sea, for both observers and crew, must be a consideration in placing observers in derby fisheries. This concern may be mitigated somewhat for the purse seine fishery, which operates under an individual vessel quota program that does not provide any incentive for vessel operators to go to sea in inclement weather in a "race for fish."

Conclusion

This is the final action. It allows for collection of information that is important to rebuilding overfished HMS and protected species, managing discards and discard mortality, and meeting the objectives of this FMP and other applicable laws.

Final Action: Voluntary observer coverage of HMS charter/headboat vessels

This action establishes a voluntary at-sea observer program for HMS charter/headboat vessel trips. Current regulations allow NMFS to select any vessel in the Atlantic tuna fisheries , including charter/headboat vessels, to carry an observer. This action expands that practice as a matter of policy to all HMS charter/headboat vessels, with actual levels of implementation subject to the availability of funding as well as the number of fishermen who volunteer to participate. NMFS received a large volume of comments on this issue which indicate a high degree of interest in a voluntary program and concern that an observer may reduce recreational enjoyment for some anglers. NMFS therefore believes there will be enough voluntary participants to establish an effective observer data collection program. This action is consistent with the ICCAT requirement of five percent observer coverage for vessels fishing for bigeye tuna and yellowfin tuna. In addition, this final action would be consistent with the ATCA requirement for comparable monitoring of recreational and commercial fisheries.

Ecological Impacts

This action is expected to have beneficial ecological effects for both HMS and other living marine resources that interact with HMS. Observers are deployed on fishing vessels to gather biological information about the composition and character of the total catch, both landed and discarded. This information supplements and ground truths logbooks, call-in reporting, and dealer reporting and is particularly valuable for collecting information about that portion of the catch that is not brought to shore. This action also supports NMFS' implementation of NS 9 in HMS fisheries because it allows for collection of information about discarded catch. Data collected under this measure will allow NMFS to explore management measures that support requirements of the Magnuson-Stevens Act as well as the objectives of this FMP. These data enhance stock assessments as well as improved management measures.

Social and Economic Impacts

NMFS received a large volume of comments on this issue which indicate a high degree of interest in a voluntary program and concern that an observer may reduce recreational enjoyment for some anglers, thereby reducing angler consumer surplus. This action results in some cost to vessel operators. Vessel operators are required to house and feed observers at the same standard provided to the rest of the crew. However, most charter/headboat trips are probably day trips and therefore few captains would incur additional expenses of an overnight trip with an observer. Most of the implementation costs are covered by NMFS, e.g., training and employing observers. A single day of observer coverage costs approximately $650 although that cost is variable depending on the characteristics of the fishery and the observer program.

This complies with the NS 10 requirement to promote safety at sea, because the observer cannot place the vessel above its maximum carriage allowance. If a charter/headboat captain volunteers to participate in the observer program, the vessel's safety gear (e.g., life jackets or personal flotation devices) must be sufficient for everyone aboard, including the observer. The owner of a six-pack (a vessel that can carry six customers) would still be able to carry six passengers-for-hire as well as the observer, as long as the vessel's capacity was not exceeded and the vessel carried the correct amount of lifesaving equipment. The charter/headboat fleet has a disincentive to fish in dangerous or adverse conditions that might deter customers from returning. Because this action is not mandatory, NMFS will not impose the economic burden of placing an observer onboard charter/headboats unless the captain volunteers to carry an observer for the purpose of data collection.

Conclusion

This action will provide valuable data on recreational HMS fisheries, including release rates and handling mortality, hook-up rates, life history information, and social and economic data that can only be obtained through the direct observation of fishing activities. At the August 1998 HMS AP meeting, several AP members expressed concern about the proposal to establish mandatory observer coverage on charter vessels selected by NMFS, especially the economic impacts that would result if an observer were to replace a paying customer. AP members also suggested that a group of paying customers may not wish to have an additional person present on their outing. NMFS recognizes these concerns, and concludes that the expected ecological benefits of the proposed alternative can be achieved through a voluntary observer program. While a voluntary program is not a random sample, NMFS may select among the pool of volunteers to get an even distribution across time and areas. The voluntary observer program may be replaced in the future by a mandatory program if NMFS concludes that additional data collection is necessary.

Rejected Option: Status quo permitting and reporting requirements

Ecological Impacts

The data collected under the current permitting and reporting requirements provide NMFS with important information about the commercial and recreational fisheries. However, implementing this alternative without increasing the quality and scope of information collected could adversely affect NMFS' ability to rebuild, monitor, and maintain healthy HMS stocks, and minimize bycatch in HMS fisheries.

Social and Economic Impacts

While continuing the status quo alternative would impose no additional burden on the regulated community, a lack of improvements to the data system could contribute to substantial negative social and economic impacts in the long term.

Conclusion

This alternative is rejected because, given the requirements of the Magnuson-Stevens Act and ATCA, NMFS is committed to continued efforts to improve data collection measures. Failure to collect additional data could hinder the effective implementation of this FMP, and thus may have significant negative ecological and social and economic consequences.

Rejected Option: Require vessel permits for all U.S. registered vessels fishing recreationally for Atlantic highly migratory species

Ecological Impacts

Information collected from permit applications could be used by NMFS to monitor participation in HMS fisheries. The vessel permit would also provide additional information to support the development of recreational fishery management policy. For example, a recreational HMS permit database would provide NMFS with a sampling frame that is the basis for fleet size calculations used for catch and effort estimates in fisheries that do not require mandatory reporting. This information would also improve monitoring and enforcement. Additional information on the vessels participating in HMS recreational fisheries would improve NMFS' ability to analyze impacts of potential management measures on small businesses.

Social and Economic Impacts

A measure to permit HMS anglers would increase the regulatory burden on recreational fishermen, by requiring that they participate in an annual permit process. However, the regulatory burden for both anglers and NMFS could be significantly reduced if HMS permitting were incorporated into the Angling category permit for Atlantic tunas, or expanding the database to include other recreational angler alternatives. Many saltwater fishermen target multiple HMS; for example, some who target billfish also catch other large pelagic species like tuna and sharks. Tuna anglers are already required to hold a recreational permit.

Annual permit issuance/renewal would not have a significant impact on small businesses. The renewal process would be automated, eliminating paperwork and mailing time for forms. The universe of affected anglers could include the following: vessel owners currently holding Atlantic tunas permits in the Angling (recreational) category, billfish anglers, and shark anglers. The extent of overlap between these three groups is unknown, but is likely to be significant. Thus, the universe of affected vessel owners is likely to be smaller than the sum of the above estimates, as only one permit would be required for participation in any HMS recreational fishery.

Recreational encounters with billfish and swordfish are generally rare, and landings are even less frequent, which makes scientifically-based sampling programs difficult to design and expensive to operate. Requiring tags may be a more feasible option for identifying the universe of recreational HMS fishermen, since anyone who lands a fish would obtain a tag, whether a vessel owner or non-vessel owner. A program implemented through state and federal cooperation has been in place for two years in North Carolina to test the use of tags for monitoring the recreational fishery for bluefin tuna. A universal HMS recreational landing tag program would require further consideration of self-reporting systems, program design and logistics, as well as obtaining public comments on how best to implement such a program. This option is included in the framework provisions; NMFS will continue to consider possibilities for expanding HMS tagging programs in future rulemaking.

Conclusion

This alternative is rejected at this time. NMFS currently requires permits in the recreational Atlantic tunas fishery, which likely includes a large part of the universe of recreational HMS anglers who own vessels. In addition, there is currently very little recreational effort directed at swordfish. Finally, NMFS believes that other final actions will adequately address the recreational shark fishery. While NMFS rejects this alternative at this time, it will likely be subject to further consideration by NMFS and the HMS Advisory Panel in the future.

Permitting and Reporting Alternatives Included in the Framework

A number of alternatives were not selected, but may be considered in the future under the framework regulatory adjustment procedure outlined in Section 3.10. If NMFS determines that a potential alternative will have a significant impact on the environment or would change the fundamental approach to management, NMFS will follow the FMP amendment procedure which is also explained in Section 3.10. Some potential alternatives under consideration include:

- Establish a single permit for all HMS recreational fisheries;
- Establish a single permit for all HMS commercial fisheries;
- Require electronic logbook reporting for all HMS fisheries;
- Establish a tagging system for all HMS caught in recreational fisheries;
- Extend the recreational call-in system to all tunas, swordfish and sharks; and
- Establish a fax reporting system for tunas, swordfish and sharks caught in recreational fisheries.

3.9 Safety of Human Life At Sea

National Standard 10 of the Magnuson-Stevens Act emphasizes the requirement that conservation and management measures shall, to the extent practicable, promote the safety of human life at sea. Fishing is an inherently dangerous activity where not all hazardous situations can be foreseen or avoided. Fishermen are continuously exposed to high risk during transit and while fishing. Commercial fishermen are required to work extremely long, unregulated hours, often under very severe environmental conditions. Professional fishermen identified inexperience, inattention, and fatigue as the most likely contributors to safety problems (NRC, 1991). Many HMS commercial fishermen fish in multiple geographical areas throughout the year. This interregional activity greatly increases the local knowledge needed by vessel captains to operate safely. Fishery management measures may constrain both recreational and commercial fishermen to fish under conditions that they would otherwise prefer to avoid. This FMP was reviewed by the HMS AP and HMS Consulting Parties, including the U.S. Coast Guard, during development of alternatives and regulations, to ensure that fishery managers recognized any impact on the safety of human life at sea and minimize or mitigate those impacts where practicable. NMFS received comments on safety issues during the public comment period and has addressed those issues in the response to comments.

As domestic management measures become more restrictive and commercial and recreational fishermen are faced with escalating costs and a near-stable or declining resource base, fishermen are sometimes forced to minimize maintenance, which has implications for safety. Cutbacks may mean less attention to preventive maintenance of fishing gear or to the vessel itself. Because many vessels that participate in HMS fisheries travel great distances from shore, selection of management measures must take into consideration economic losses and the potential effects on the safety of human life at sea. Some form of insurance is needed by fishing vessel owners to protect themselves against loss or damage to their vessels and potential financial liabilities that can result from injuries or damage to others, including their own crew members. Increased vessel loss and crew claims increase insurance costs for all fishermen. Recognizing these economic considerations should be a major motivation to address vessel safety issues (NRC, 1991).

The following safety considerations have been considered in evaluating the management measures outlined in this FMP.

Operating environment:	An FMP should try to avoid creating situations that result in vessels going out farther, fishing longer, or fishing in weather worse than they generally would have in the absence of management measures.
Gear and vessel loading:	An FMP should consider the safety and stability of fishing vessels when requiring specific gear or requiring the removal of gear from the water.
Limited season and area:	An FMP should attempt to mitigate the effects caused by "derby" fisheries, and avoid them in new management regimes.

In both recreational and commercial fisheries, the primary responsibility for safety resides with the vessel operator. NMFS does not have information regarding losses of recreational vessels. In 1996, 31 deaths and 69 vessel losses were documented by the U.S. Coast Guard resulting from fishing trips in the Atlantic Ocean and Gulf of Mexico (USCG, 1996). Casualty data from 1997 were specific to the type of vessel and illustrate the relatively low rate of casualties in the Atlantic longline fishery. In 1997, there were two Atlantic longline vessels that sank and were reported by the USCG. One vessel sank as a result of a collision, but the three persons on board did not use survival craft. The other vessel caught fire which was attributed to a battery spark and the four crew members were picked up in a life raft. One vessel was reported as a loss and the other vessel was later salvaged (USCG, 1997). In general, collisions stand out as a safety problem on the Gulf Coast while material failure incidents are high along the North Atlantic coast (NRC, 1991). Weather has been cited as a particular problem for the isolated distant water pelagic longline fleet. HMS fishing vessels tend to have less machinery on board than the larger processing vessels or trawling vessels.

Accidents on HMS vessels may occur when handling (landing or releasing) hooked billfish, large tunas and sharks or can occur as a result of fatigue (handling large numbers of fish). Accidents that can occur on longline vessels involve crew that are hooked and pulled overboard or injured by a "springing" leader resulting from the release of a fish. It is estimated there are occasionally hook-related accidents per year in the pelagic longline fleet. Accidents that can occur on purse seine vessels include general injuries caused by handling fish (e.g., poisoning from being stuck by fins), as well as accidents related to using the cables and winch to move giant bluefin tuna.

Damage to vessels in storms may result in bodily injury from broken windows or unstowed gear. Releasing large fish or protected species (large sea turtles or marine mammals) is difficult in rough seas and can result in bodily injury, especially back injuries for both recreational and commercial fisheries. NMFS encourages the use of dehookers which may facilitate the release of large fish. NMFS advises vessel operators to avoid unsafe conditions, have regular U.S. Coast Guard inspections, purchase and maintain safety equipment, educate and train crew members or paying customers, and be prepared for emergencies. Further, NMFS encourages all HMS fishermen to use VMS for additional safety and communication benefits.

3.9.1 Fishery Access and Weather-Related Vessel Safety

The following fishery management regulations have raised concerns by the fishermen in that they directly or indirectly pose a hazard to the crew or vessel safety under adverse weather or ocean conditions. Such measures particularly may affect, or have the potential to affect, the operation of fishing vessels and safety risks taken by vessel operators under adverse weather or ocean conditions.

Quotas

***Safety Concern*:** Derby conditions and resulting decreased maintenance and attention to other safety precautions as a result of limited quota in the bluefin tuna, swordfish, and shark fisheries.

***Mitigating Factors*:** The limited access program that is outlined in Chapter 4 of this document may reduce the potential for an increased derby fishery targeting sharks and swordfish. NMFS has prohibited the use of driftnet gear in the Atlantic swordfish fishery, thereby eliminating the unsafe conditions of that derby-style fishery. NMFS has also implemented a 4,000-pound large coastal shark retention limit which may prevent small vessels from overloading their holds and becoming unstable and slows the derby effect of the fishery. Effort controls in the General category bluefin tuna fishery are developed with the assistance of fishery participants, and safety concerns are considered in developing these regulations. In addition, NMFS tries to avoid one day openings of the General category fishery in order to avoid sending fishermen out in unsafe weather conditions. Further, NMFS will establish commercial shark seasons in advance, which will allow shark fishermen to know the length of the season ahead of time and should reduce the “race for fish.” Any overharvest or underharvest will be added to/subtracted from the same season in the following fishing year. It has been suggested by HMS fishermen that ITQs may provide a more practical solution to minimizing the derby effects in some HMS fisheries.

***Safety Concern*:** Destabilization of traditional fishing patterns which results in vessel captains fishing in unfamiliar waters and/or with unfamiliar gear due to reductions in available quota.

***Mitigating Factors*:** NMFS limits access to the directed and incidental shark and swordfish fisheries and to the tuna longline fishery in this FMP, in part to encourage stabilization of the commercial fisheries. Industry representatives have emphasized to NMFS the importance of defining and limiting the universe of participants, partly to allow effective dissemination of safety information and to allow development of a stable, experienced fishing fleet.

Bycatch Reduction Measures

Safety Concern**:** Destabilization of traditional fishing patterns which results in vessel captains fishing in unfamiliar waters and/or with unfamiliar gear due to time/area closures.

Mitigating Factors**:** Time/area closures in the pelagic longline fishery will re-distribute fishing effort. Minimum sizes for sharks (bottom longline fishery) which may also act as "time/area closures" as they may cause fishermen to fish farther offshore, away from nursery areas. As a result of these new management measures, crowding can occur as vessels "jockey" for good fishing positions on the prime fishing grounds. These practices can pose a safety threat to the captains and crews of those vessels.

Industry representatives have emphasized to NMFS the importance of defining and limiting the universe of participants, partly to allow effective dissemination of safety information and to allow development of a stable, experienced fishing fleet. NMFS limits access to the directed and incidental shark and swordfish fisheries in this FMP, in part to encourage stabilization of the commercial fisheries. NMFS will establish commercial shark seasons in advance, which will allow shark fishermen to know the length of the season ahead of time and should allow fishermen more time to plan their fishing trips to avoid bad weather.

NMFS rejects the alternative to establish "no-transit zones" which would force fishermen to "detour" around large closed areas , and which may have significant safety implications. The time/area closure for pelagic longline vessels in the Mid-Atlantic has been made smaller than that proposed in response to comments received that indicated a safety threat to smaller vessels that would have to travel to the far side of the Gulf Stream in order to fish. The proposed Florida Straits closure has been rejected in this final FMP in favor of establishing a larger area. The larger closed area may prevent smaller fishing vessels from fishing "around" the closed area. This may reduce the safety concerns as vessels may be motivated to pursue other fishing activities during a closure time in their area.

Use of VMS allows vessels to travel through closed areas with their fishing gear stowed. VMS allows on-shore enforcement agents to monitor the travel pattern of a vessel. Travel pattern can indicate if a longline vessel is simply transiting an area, or if it is setting gear, waiting through the soak time, and hauling the gear back. Some VMS units increase a vessel's ability to communicate with shore, providing added safety assurances in the case of bad weather.

Retention Limits

Safety Concern**:** Injury to fishermen while attempting to measure and, if necessary, discard HMS, particularly sharks, to comply with the minimum size requirement.

Mitigating Factors**:** Handling large, feisty fish is inherently a risky task. Cuts and abrasions occur, as do more serious accidents related to entanglement of fishermen or their hands in fishing gear. The minimum size for tunas is a reasonable safety risk given that tunas a little larger or smaller than the minimum size are not likely to be unwieldy (27-inch curved fork length minimum). Billfish, however must be released by all commercial vessels and the minimum size is such that billfish pose a safety risk for recreational fisherman as well. With this FMP, NMFS implements a minimum size for all sharks in the recreational fishery (4.5 feet FL), with an exception that no minimum size applies to Atlantic sharpnose sharks. NMFS establishes a minimum size for ridgeback sharks (4.5 feet FL) in the commercial fishery as well. Public comments suggest that many shark anglers and tournaments voluntarily follow minimum sizes equivalent to or higher that the one implemented in this FMP. NMFS will include a discussion on the proper handling of released HMS, including large fish and protected species such as marine mammals and sea turtles as part of the agenda for public workshops and widespread dissemination of information. NMFS intends for experienced fishermen to share their experiences with others in order to mitigate any safety concerns for the fishermen and the fish.

***Safety Concern*:** Incentive to fish in bad weather due to effort control measures.

***Mitigating Factors*:** Effort controls in the General category bluefin tuna fishery such as monthly quotas and "restricted-fishing days" may encourage fishermen to fish in conditions which they generally would avoid. These regulations can result in concentrated fishing effort at the beginning of the month until the quota is reached. Restricted-fishing days can exacerbate derby conditions since the fishing effort is concentrated on the open fishing days. A continuous season, without monthly or time-period subquotas or restricted-fishing days, may partially alleviate the derby nature of the fishery as well some safety concerns. This issue has been discussed by the HMS AP and by the public at numerous public hearings.

While derby fishing conditions and weather-related access issues exist in the tuna fishery, to date they have not appeared to pose a substantial threat to safety at sea. Safety concerns are considered in developing all effort control regulations. Restricted-fishing days may alleviate the fatigue associated with many consecutive one day fishing trips. These days off provide a needed "rest" for fishermen. In past years, NMFS has reopened a fishery when adverse weather conditions prevented fishermen from harvesting the quota. Effort control regulations are intended to spread out the General category fishing season, both temporally and geographically, in order to collect better scientific information and improve fishing opportunities and ex-vessel prices. They have been developed with the assistance of fishery participants, and NMFS and the public have regular opportunities to review these regulations through annual effort control specifications, public hearings, and the AP process.

***Safety Concern*:** Incentive to fish in bad weather or when fatigued due to the requirement to be in port at the time of the directed fishery closure.

***Mitigating Factors*:** Requiring fishermen to be in port or offloaded by the time of a directed fishery closure may place time constraints on fishing activities and travel back to shore, perhaps providing an incentive for vessels to take risks with adverse weather or fatigue that are not in the best interests of safety. NMFS finalizes regulations through this FMP to allow for an ongoing VMS delayed offloading provision. With VMS operating under specifications, vessels must cease fishing at the time of the closure but may offload at any time after the closure, provided no fishing takes place until all HMS are offloaded.

***Safety Concern*:** Hazards resulting from limited vessel length upgrading in the limited access program.

***Mitigating Factors*:** NMFS has worked with the New England and Mid-Atlantic Fishery Management Councils over the last few years in developing upgrading regulations that are consistent across fisheries to reduce confusion and regulatory burdens on fishermen that participate in multiple fisheries under multiple jurisdictions. However, NMFS received numerous comments that the majority of fishermen affected by the limited access system for the Atlantic swordfish and shark fisheries do not participate extensively in fisheries that are under the jurisdiction of these councils and that the vessel length and horsepower upgrading restrictions developed, which are appropriate for trawl fisheries, are not appropriate for longline fisheries. Further, increasing vessel length is an important part of increasing safety at sea, especially for vessels fishing further and further offshore due to time/area closures and other regulations. Therefore, NMFS implements the restrictions on vessel upgrading as a final measure at this time to prevent substantial increases in the harvesting capacity of HMS vessels but will consider alternative criteria to control the harvesting capacity in ways that minimize safety concerns. NMFS will assemble data on hold capacity, consider requesting hold capacity information on permit applications, and consider proposing HMS -specific vessel upgrading restrictions that account for necessary upgrades in horsepower and vessel length to address safety concerns.

Permitting and Reporting

***Safety Concern*:** Lack of sufficient rest or maintenance time due to reporting requirements.

***Mitigating Factors*:** NMFS finalizes the requirement that pelagic logbooks must be completed within 48 hours of completing a set (instead of the proposed 24 hours) and before offloading HMS. NMFS feels that giving fishermen an extra 24 hours to complete the logbook entry will minimize the safety concern. NMFS understands that it is current practice for vessel operators to complete a master or captain's log and NMFS recommends that the pelagic logbook be treated as such. This facilitates enforcement of time/area closures and other measures. NMFS is considering electronic logbook reporting in the future which may reduce the time needed to fill out paper forms and submit them to NMFS.

3.9.2 Procedures for Consideration of Management Adjustments

The views of fishery participants and other concerned citizens are obtained by the HMS Management Division through regularly scheduled HMS Advisory Panel meetings as well as the ICCAT Advisory Committee, public hearings, public meetings, and constituent input through letters and phone calls. Scoping meetings were held for the development of this

FMP and public hearings were held on the draft FMP, the Addendum, and the proposed and supplemental rule. Public hearings are held regularly on proposed regulations. All HMS Consulting Parties are consulted during the public comment period of rulemakings. These Consulting Parties include the Department of State, the U.S. Coast Guard, the ICCAT Commissioners, fishery management councils, and other entities listed in the proposed HMS Process (NMFS, 1997). These fora provide NMFS an opportunity to consider the implications of proposed management measures, including their safety implications. Procedures to adjust the management measures are described in Section 3.10.4. NMFS will provide flexibility to adjust measures for safety concerns to the degree possible (e.g., add weather and ocean conditions as factors to consider in framework measures when making inseason adjustments).

To date, safety issues have been considered by the full HMS AP. Under the Statement of Operating Procedures for the HMS AP, NMFS may establish a sub-panel of the HMS AP. For some proposed management measures, this sub-panel would be established to monitor, evaluate, and report on the effect of management measures on vessel or crew safety, particularly under adverse weather or ocean conditions. Observer data should also provide useful information regarding some fishing techniques, hazards, etc. NMFS has instituted voluntary observer coverage in the Charter/Headboat category which is expected to provide additional information about the fishery.

3.9.3 Other Safety Issues

There are other issues beyond fishery access and weather-related vessel safety that need to be considered in this HMS FMP. NMFS would like to avoid management measures that require hazardous at-sea inspections or enforcement, to the extent practicable, if other comparable enforcement could be accomplished as effectively. VMS allows some fishery management regulations to be enforced from a base station staffed by the U.S. Coast Guard or the NMFS Office for Law Enforcement. This may reduce the need for at-sea enforcement in some cases.

Gear and deployment restrictions proposed for the pelagic longline fishery in the Atlantic Offshore Cetacean Take Reduction Plan to reduce bycatch of marine mammals may raise safety concerns. For instance, requiring fishermen to haul their gear in the order it was set may force many vessels to operate on the margin of fuel consumption or carry more fuel in order to maintain the length of the trip despite extra travel time to the beginning of the mainline for hauling. The reverse haulback alternative is rejected, partly out of concern for safety at sea. Conversely, the educational workshops for all HMS vessel operators could serve as platforms to remind vessel operators of their safety requirements and facilitate discussion about safety concerns. NMFS will work with the national weather service to support accurate weather forecast for offshore waters. Vessels with VMS may be able to work cooperatively with the National Weather Service to provide information about offshore weather conditions.

3.10 Ongoing Management

3.10.1 An Introduction to FMP Amendments and Frameworks

The activities involved in continuing fishery management include monitoring, evaluation, adjustment, and revision. There are two primary methods that can be used to change management measures included in an FMP: FMP amendment and framework regulatory adjustment. As described in Chapter 1, NMFS will follow the HMS process for all FMP amendments. FMP amendments are performed when the proposed action is significant (i.e., will have a significant impact on the environment or would change the fundamental approach to management). The eight phases of the HMS administrative process are as follows:

- Phase 1 -- Planning and Scoping.
- Phase 2 -- Preparation of Draft Documents; Consultations and Meetings.
- Phase 3 -- Initial Public Review and Comment Period; NEPA Public Review and Comment Period; ANPR Public Review and Comment Period, if necessary; and Public Hearings.
- Phase 4 -- Preparation of Revised Documents and Proposed Regulations; Consultations and Meetings.

- Phase 5 -- Final Public Review and Comment Period; Proposed Regulations Published for Public Review and Comment.
- Phase 6 -- Preparation of Final Documents and Final Regulations.
- Phase 7 – Approval and implementation.
- Phase 8 – Continuing and contingency fishery management.

Unlike FMP amendments, the framework regulatory adjustment procedure provides for timely changes to the regulations that implement FMP management measures in response to new information about the fishery. Framework adjustment lends flexibility and efficiency to the regulatory process by allowing NMFS to make time-critical changes in the regulations, such as inseason adjustments, without the lengthy and cumbersome process of amending the FMP. Framework adjustment is not intended to circumvent the FMP amendment process that must take place when circumstances in the fishery change substantially or when a different management philosophy or objectives are adopted, triggering significant changes in the management system. Rather, framework adjustment is intended to make it possible to manage fisheries and meet the objectives of the FMP more responsively under conditions requiring timely management actions. As with an FMP amendment, framework adjustments must go through extensive public and analytical review, including development and review by the APs. This includes a proposed rule, a public comment period, at least one public hearing, and a final rule. AP meetings will be held for a rulemaking if the agency deems it necessary for purposes of consultations or AP review.

3.10.2 Stock Assessment and Fishery Evaluation Report

NS 2 of the Magnuson-Stevens Act requires that NMFS take into account the best scientific information available in developing FMPs and implementing regulations. For HMS, except sharks, NMFS relies on SCRS analyses. For sharks, NMFS directs the shark evaluation workshop process. The guidelines for implementation of NS 2 require preparation of an annual Stock Assessment and Fishery Evaluation (SAFE) report. The SAFE report will largely rely on SCRS assessments, the shark evaluation workshop assessments, and any new fishery information. These guidelines for a SAFE report are below.

(e) (1) The SAFE report is a document or set of documents that provides [the Secretary] with a summary of information concerning the most recent biological condition of stocks and the marine ecosystems in the [management unit] and the social and economic condition of the recreational and commercial fishing interests, fishing communities, and the fish processing industries. It summarizes, on a periodic basis, the best available scientific information concerning the past, present, and possible future condition of the stocks, marine ecosystems, and fisheries being managed under Federal regulation.

(i) The Secretary has the responsibility to assure that a SAFE report or similar document is prepared, reviewed annually, and changed as necessary for each FMP. The Secretary or Councils may utilize any combination of talent from Council, state, Federal, university, or other sources to acquire and analyze data and produce the SAFE report.

(ii) The SAFE report provides information to the [Office for Sustainable Fisheries] for determining annual harvest levels from each stock, documenting significant trends or changes in the resource, marine ecosystems, and fishery over time, and assessing the relative success of existing state and Federal fishery management programs. Information on bycatch and safety for each fishery should also be summarized. In addition, the SAFE report may be used to update or expand previous environmental and regulatory impact documents, and ecosystem and habitat descriptions.

(iii) Each SAFE report must be scientifically based, and cite data sources and interpretations.

(2) Each SAFE report should contain information on which to base harvest specifications.

(3) Each SAFE report should contain a description of the maximum fishing mortality threshold and the minimum stock size threshold for each stock or stock complex, along with information by which the [Secretary] may determine:

(i) Whether overfishing is occurring with respect to any stock or stock complex, whether any stock or stock complex is overfished, whether the rate or level of fishing mortality applied to any stock or stock complex is approaching the maximum fishing mortality threshold, and whether the size of any stock or stock complex is approaching the minimum stock size threshold.

(ii) Any management measures necessary to provide for rebuilding an overfished stock or stock complex (if any) to a level consistent with producing the maximum sustainable yield in such fishery.

(4) Each SAFE report may contain additional economic, social, community, essential fish habitat, and ecological information pertinent to the success of management or the achievement of objectives of each FMP.

Each year in January or February, NMFS will publish one SAFE report for the species in this FMP and for billfish. The SAFE report will follow the guidelines specified in NS 2 and will be used by NMFS to develop and evaluate regulatory adjustments under the framework procedure or the FMP amendment process. This information will provide the basis for determining annual harvest levels from each stock, documenting significant trends or changes in the resource, the bycatch, and the fishery over time, and assessing the relative success of existing state and Federal fishery management programs. In addition, the SAFE report will be used to update or expand previous environmental and regulatory impact documents, and ecosystem and habitat descriptions, including EFH.

3.10.3 Advisory Panel and Continuing Fishery Management

The Assistant Administrator is responsible for implementing, monitoring, and amending the HMS FMP and its implementing regulations. As required by section 302(g)(4) of the Magnuson-Stevens Act, NMFS established an HMS AP to assist in the collection and evaluation of information relevant to the development of the HMS FMP and any subsequent amendments. Decisions and recommendations of the AP are advisory in nature. Following publication of the annual SAFE report, NMFS will convene the AP to evaluate management measures relative to the objectives of the FMP. NMFS may also convene meetings of the AP at other appropriate times throughout the year. If NMFS, with the assistance of the AP, concludes that the FMP must be amended to achieve the objectives of the FMP, NMFS will follow the HMS process for amending an FMP. Alternatively, NMFS may determine that it is not necessary to amend the FMP but that a regulatory amendment is appropriate under framework provisions of the FMP to achieve the objectives of the FMP.

3.10.4 Procedure for Adjusting the Management Measures

Based on the annual SAFE report, deliberations of the AP, and other relevant factors, NMFS will determine whether any adjustments to the regulations are necessary to implement the FMP's management measures and to achieve the management objectives and rebuilding programs stated in this FMP. Adjustments made through the framework to meet the objectives of the FMP may include changes in:

- actions to implement ICCAT recommendations, as appropriate;
- domestic quotas;
- Atlantic tunas Purse Seine category cap on bluefin tuna quota;
- commercial retention limits;
- recreational retention limits;
- maximum sustainable yield or optimum yield levels based on the latest stock assessment or updates in the SAFE report;
- species size limits;
- permitting and reporting requirements;
- composition of the species groups;
- fishing year or season;
- time/area restrictions;
- target catch requirements;
- gear prohibitions, modifications, or use restrictions;
- effort restrictions; and
- essential fish habitat.

Optimum yield for many of the species in the management unit will change substantially as the stocks are rebuilt to the level necessary to provide the maximum sustainable yield. The resultant fishing mortality rate will therefore need adjusting as stocks respond to changes both in the expected manners and in ways unpredictable at this time. The benefits of and the costs of regulatory actions necessary to establish these fishing mortality rate adjustments can be managed better by maximizing the timeliness of their implementation. However, it is imperative that members of the public have sufficient opportunity to comment on proposed management measures. The benefits of timeliness do not exceed the costs of inadequate public participation. These expectations and constraints were considered in developing the above list. The extent to which the regulations can be changed through the framework is limited by the consistency each future regulation would have with the FMP's goals and objectives. For example, any shark species that might be considered for inclusion in the FMP's prohibited category could be added only by amending the FMP. But a change in recreational retention limits could be implemented through the framework process because the FMP uses retention limits to affect fishing mortality without specifying the exact recreational retention limit to be applied to the each species in the FMP.

The goal is to implement regulatory changes by the start of the new fishing year or as soon after a new stock assessment or updated SAFE report as possible. If NMFS determines that adjusting the management measures is necessary to achieve the objectives of the FMP and its rebuilding programs, it will prepare a regulatory package including a discussion of the need for action; the proposed adjustments to the management measures; analyses as required by applicable law of the social, economic, environmental, and ecological impacts of the proposed measures; and the proposed rule. The comment period on the proposed rule will generally be 45 days, but may be extended or reduced as appropriate. NMFS will hold at least one public hearing and an AP meeting, if necessary, on each proposed rule.

After reviewing public comments and additional information or data that may be available, NMFS will, if appropriate, make final determinations regarding consistency of the proposed conservation and management measures with the objectives of the FMP, the National Standards, and other applicable law. Within 30 days of the close of the public comment period on the proposed rule, NMFS will publish a final rule in the *Federal Register*.

If circumstances warrant during the year (e.g., changes in regulations in related fisheries), NMFS may take regulatory action independent of the SAFE report. NMFS will subsequently follow the procedures outlined above.

In order to improve the information upon which EFH delineations are based, NMFS may change or update the EFH provisions through a framework process analogous to the regulatory framework. The modified process is required because the EFH provisions have no accompanying regulations that can be modified under the standard framework procedure. Under the analogous process, NMFS will publish a notice of the proposed changes in the *Federal Register* a notice of the changes to the EFH as approved. Components of the EFH provisions that may be changed under this framework procedure include life history information of managed species, identification of threats to EFH and appropriate conservation measures, assessment of fishing impacts on EFH, identification of EFH habitat areas of particular concern, and any other subjects that contain no regulatory action.

3.10.5 Shark Operations Team

The original Shark FMP established an Operations Team (OT) to advise NMFS and monitor the shark fishery, evaluate the effectiveness of the FMP, and recommend necessary adjustments to management measures. The OT included representatives from the NMFS Northeast and Southeast Regional Offices and the Washington Office, staff and/or members from each of the five Councils, and scientists from the NMFS Northeast and Southeast Fisheries Science Centers. NMFS typically convened the OT once a year.

Final Action: Dissolve OT as superceded by HMS AP

This action dissolves the OT because the HMS AP serves an essentially similar advisory role on Atlantic shark management.

Ecological Impacts

This action has no direct ecological impacts, although shark stocks may benefit from the AP and NMFS addressing HMS fisheries in a multi-species context, particularly concerning bycatch issues.

Social and Economic Impacts

This action may decrease confidence in the management process through the loss of the OT forum for scientific debate specifically for sharks. However, the stock evaluation workshops have generally been open to the public. This action is not expected to have economic impacts.

This action reduces the administrative cost of managing the shark fishery by consolidating the development and review of management measures into the HMS AP process.

Conclusion

This action is selected because the HMS AP serves an essentially similar role to that provided by the OT and because of the reduced administrative cost.

Rejected Options for the Shark Operations Team

Rejected Option: Status quo

This alternative would maintain the OT as separate group from the HMS AP to advise NMFS on Atlantic shark management.

Ecological Impacts

This alternative would have no direct ecological impacts.

Social and Economic Impacts

This alternative may provide NMFS with additional feedback and insight by providing additional scientific debate in the shark management process. This alternative is not expected to have economic impacts.

This alternative would increase the administrative costs of managing the shark fisheries by requiring meetings, planning time, and constituent time beyond that required for the HMS AP.

Conclusion

This alternative is rejected because of the administrative costs of maintaining two advisory bodies that serve essentially similar roles and the need to manage HMS fisheries in a comprehensive, multi-species way.

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